DOE/EIS-126-F

United States Department of Energy

Final Environmental Impact Statement

REMEDIAL ACTIONS AT THE FORMER CLIMAX URANIUM COMPANY URANIUM MILL SITE GRAND JUNCTION, MESA COUNTY, COLORADO

VOLUME I - TEXT

DECEMBER, 1986

U.S. DEPARTMENT OF ENERGY

Uranium Mill Tailings Remedial Action Project UMTRAP

Department of Energy
Albuquerque Operations Office
P.O. Box 5400
Albuquerque, New Mexico 87115

January 8, 1987

Dear Friend:

Enclosed is a copy of the Department of Energy (DOE) final Environmental Impact Statement (EIS), Remedial Action at the Former Climax Uranium Company Uranium Mill Site, Grand Junction, Mesa County, Colorado (DOE/EIS-0126F, December 1986).

In November, 1978, Congress enacted Public Law 95-604, the "Uranium Mill Tailings Radiation Control Act of 1978." The Act authorizes the DOE to enter into cooperative agreements with the affected states and Indian tribes in order to establish remedial action programs at inactive uranium mill tailings sites. The Act stipulates that the DOE will meet the applicable standards promulgated by the Environmental Protection Agency. It further states that the Nuclear Regulatory Commission (NRC) is to concur in all major decisions and to license the maintenance and monitoring of the final disposal sites.

Twenty-two sites, including Grand Junction, Colorado, have been designated as eligible for remedial action. A cooperative agreement covering the guidelines, responsibilities and conditions for remedial actions at Grand Junction and other Colorado sites was signed by Colorado and the DOE, was concurred in by the NRC, and became effective on October 19, 1981.

The final statement has been prepared in compliance with the National Environmental Policy Act of 1969 to assess the environmental impacts of a proposed DOE action to reduce the radiation levels existing at the Grand Junction site. DOE's preferred alternative, as identified in the final EIS, is to decontaminate the Grand Junction site and dispose of the material at the Cheney Reservoir Disposal Site.

Copies of the final EIS are being provided to agencies, organizations, and persons who commented on the draft or who requested a copy of the final statement. A Record of Decision will be issued not less than 30 days after availability of the final EIS is announced in the Federal Register.

Sincerely,

James R. Anderson

James R. Anderson, Project Manager
Uranium Mill Tailings Project Office

Enclosure

title not found

acc# not found

COVER SHEET

Final Environmental Impact Statement

Remedial Actions at the

Former Climax Uranium Company Uranium Mill Site

Grand Junction, Mesa County

Colorado

(a) Lead agency: U.S. Department of Energy (DOE)
Cooperating Agencies: U.S. Department of the Interior; Bureau of Land Management (BLM); U.S. Nuclear Regulatory Commission (NRC)

(b) Proposed action: Cleanup of the contaminated material at a mill site and associated vicinity properties in Grand Junction, Colorado, designated by the Uranium Mill Tailings Radiation Control Act of 1978.

(c) For further information, contact (1) Mr. John G. Themelis, Project Manager, Uranium Mill Tailings Remedial Action Project Office, U.S. Department of Energy, Albuquerque Operations Office, 5301 Central Avenue, N.E., Suite 1700, Albuquerque, New Mexico, 87108, phone: (505) 844-3941; (2) Dr. Robert J. Stern, Director, Office of Environmental Guidance, U.S. Department of Energy, Office of the Assistant Secretary for Environment, Safety and Health, Room 3G-092, Forrestal Building, 1000 Independence Avenue, S.W., Washington, D.C., 20585, phone: (202) 252-4600; (3) Mr. Henry Garson, Esq., Assistant General Counsel for Environment, U.S. Department of Energy, Room 6D-033, Forrestal Building, 1000 Independence Avenue, S.W., Washington, D.C., 20585, phone: (202) 252-6947; or Mr. Richard Freel, District Manager, Bureau of Land Management, 764 Horizon Drive, Grand Junction, Colorado, 81501, phone: (303) 243-6552.

(d) Designation: Final Environmental Impact Statement (FEIS)

For copies of the FEIS, contact the Project Manager.

(e) Abstract: This statement evaluates and compares the environmental impacts associated with the remedial actions of the residual radioactive materials remaining at the inactive uranium processing site and associated vicinity properties at Grand Junction, Mesa County, Colorado. This statement is also intended to aid the BLM in amending their management framework plans and final resource management plan, as well as assisting in compliance with the withdrawal application as appropriate.

The site is a 114-acre tract of private and state owned land which contains approximately 3.1 million cubic yards of tailings and associated contaminated soils. The vicinity properties are homes, businesses, public buildings, and vacant lots which may have been contaminated during construction

COVER SHEET

Final Environmental Impact Statement

Remedial Actions at the

Former Climax Uranium Company Uranium Mill Site

Grand Junction, Mesa County

Colorado

(a) Lead agency: U.S. Department of Energy (DOE)
Cooperating Agencies: U.S. Department of the Interior; Bureau of Land Management (BLM); U.S. Nuclear Regulatory Commission (NRC)

(b) Proposed action: Cleanup of the contaminated material at a mill site and associated vicinity properties in Grand Junction, Colorado, designated by the Uranium Mill Tailings Radiation Control Act of 1978.

(c) For further information, contact (1) Mr. John G. Themelis, Project Manager, Uranium Mill Tailings Remedial Action Project Office, U.S. Department of Energy, Albuquerque Operations Office, 5301 Central Avenue, N.E., Suite 1700, Albuquerque, New Mexico, 87108, phone: (505) 844-3941; (2) Dr. Robert J. Stern, Director, Office of Environmental Guidance, U.S. Department of Energy, Office of the Assistant Secretary for Environment, Safety and Health, Room 3G-092, Forrestal Building, 1000 Independence Avenue, S.W., Washington, D.C., 20585, phone: (202) 252-4600; (3) Mr. Henry Garson, Esq., Assistant General Counsel for Environment, U.S. Department of Energy, Room 6D-033, Forrestal Building, 1000 Independence Avenue, S.W., Washington, D.C., 20585, phone: (202) 252-6947; or Mr. Richard Freel, District Manager, Bureau of Land Management, 764 Horizon Drive, Grand Junction, Colorado, 81501, phone: (303) 243-6552.

(d) Designation: Final Environmental Impact Statement (FEIS)

For copies of the FEIS, contact the Project Manager.

(e) Abstract: This statement evaluates and compares the environmental impacts associated with the remedial actions of the residual radioactive materials remaining at the inactive uranium processing site and associated vicinity properties at Grand Junction, Mesa County, Colorado. This statement is also intended to aid the BLM in amending their management framework plans and final resource management plan, as well as assisting in compliance with the withdrawal application as appropriate.

The site is a 114-acre tract of private and state owned land which contains approximately 3.1 million cubic yards of tailings and associated contaminated soils. The vicinity properties are homes, businesses, public buildings, and vacant lots which may have been contaminated during construction

by the use of tailings as building material. An estimated 3465 vicinity properties would be cleaned up during remedial action of the tailings pile. The tailings were produced by the former Climax Uranium Company which processed uranium ore, which it sold to the U.S. Atomic Energy Commission from 1951 to 1966 and to private sources from 1966 to 1970.

This statement evaluates six alternatives for stabilization and disposal of the tailings and other contaminated materials:

Alternative 1	No action.
Alternative 2	Stabilization at the Grand Junction site.
Alternative 3	Disposal at the Cheney Reservoir site with truck transport.
Alternative 4	Disposal at the Cheney Reservoir site with train and truck transport.
Alternative 5	Disposal at the Two Road site with truck transport.
Alternative 6	Disposal at the Two Road site with train and truck transport.

All of the alternatives except no action include remedial action at an estimated 3465 vicinity properties.

Alternative 3 is DOE's preferred alternative.

The primary impacts of Alternative 1 would be more than 1000 excess cancer deaths in 1000 years among the population of Mesa County from the above background levels of radiation emitted by the Grand Junction site and the vicinity properties. Implementation of the other alternatives would reduce the release of radiation to EPA standards and would significantly reduce the number of excess cancer deaths.

Other major impacts of Alternative 1 would be the continued restriction of 114 acres adjacent to the city of Grand Junction from other land uses and the potential for continued wind and water erosion of the unstabilized tailings pile.

The primary impacts of Alternative 2 would be the exceedence of Federal and state air-quality standards for the release of particulates (dust), disturbance of residents near the Grand Junction site during the daytime from noise generated by construction activities, and the restriction of 93 acres adjacent to the city of Grand Junction from other land uses. The estimated excess cancer deaths are higher (about 20 in 1000 years) for this alternative than the other stabilization alternatives (about two in 1000 years).

The primary impacts of Alternative 3 would be a large increase in traffic (primarily trucks) around the Grand Junction site and on U.S. Highway 50 south of Grand Junction with an associated increase in accidents, congestion, and road maintenance; the exceedence of Federal and state air-quality standards for the release of particulates; and disturbance of residents near the Grand Junction site during the daytime from noise generated by construction activities. Under this alternative the tailings would be stabilized on relatively remote Federal land.

The primary impacts of Alternative 4 would be the same as Alternative 3 except the large increase in truck traffic would occur mainly between Whitewater and the disposal site.

The primary impacts of Alternative 5 would be a large increase in traffic (primarily trucks) around the Grand Junction site and on Interstate 70 and U.S. Highway 6 & 50 west of Grand Junction with an associated increase in accidents, congestion, and road maintenance; the exceedence of Federal and state air-quality standards for the release of particulates; and disturbance of residents near the Grand Junction site during the daytime from noise generated by construction activities. Under this alternative the tailings would be stabilized on relatively remote Federal land.

The primary impacts of Alternative 6 would be the same as Alternative 5 except the large increase in truck traffic would occur mainly on U.S. Highway 6 & 50 between Mack and the disposal site.

The primary impacts of remedial action at the vicinity properties would be temporary disturbance of nearby residents from noise, and an increase in employment and population in Mesa County.

(f) This FEIS contains several changes from the Draft Environmental Impact Statement (DEIS) issued in March, 1986. These changes include the following:

- o Addition of Section 6.0 which contains summaries of all public comments, the DOE's responses, and photocopies of public comments.
- o Modification to Appendix G, Floodplain and Wetlands Assessment, in response to a decrease in contaminated areas of the riparian zone along the Colorado River, based on additional surveys.
- o The potential co-disposal of Grand Junction site waste. Sections 1.2, 3.2.10, 5.0, and 5.16.6 reflect this change.
- o Modification to Appendix F, Hydrology Report, to include additional data and analyses.

DOE/EIS-0126-F

Final Environmental Impact Statement

REMEDIAL ACTIONS AT THE FORMER CLIMAX URANIUM COMPANY URANIUM MILL SITE GRAND JUNCTION, MESA COUNTY, COLORADO

VOLUME I - TEXT

DECEMBER, 1986

U.S. DEPARTMENT OF ENERGY

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Concluded)

Appendices A through E, and H through M were printed in the DEIS and are incorporated by reference in this FEIS. Modification to the Appendices in response to comments are included in Section 6.0; Section 6.25 contains an Errata Sheet that reflects modifications to Appendices A through E and H through M.

LIST OF FIGURES

LIST OF TABLES

LIST OF TABLES (Concluded)

1.0 SUMMARY

1.1 BACKGROUND

The Grand Junction site is a 114-acre property adjacent to the south side of the city of Grand Junction, Colorado, and adjacent to the north side of the Colorado River (Figure 1.1). The site consists of the tailings area, mill site, and effluent ponds from the former Climax Uranium Mill site which was operated by the Climax Uranium Company between 1951 and 1970. The State of Colorado presently uses a portion of the site (the State Repository) for temporary storage of material obtained from remedial action at vicinity properties in the Grand Junction area.

The Grand Junction site contains an estimated 3.1 million cubic yards of contaminated materials in the form of finely ground sand and slimes and contaminated soils. The tailings are covered with approximately six inches of soil, and sparse vegetation occurs on the site. Concrete and brick from the demolished mill buildings were placed as riprap along the north bank of the Colorado River (Figure 1.2).

Many vicinity properties also occur in the Grand Junction area. Vicinity properties are homes, businesses, public buildings, and vacant lots which may have been contaminated during construction by the use of tailings as a building material or as fill material before the hazards associated with this material were known. The use of the tailings for these purposes is no longer allowed.

Approximately 6905 properties in Mesa County have been found to possibly have elevated levels of radiation. Of these, it is estimated that 3465 will be formally included on the vicinity property list and thereby require remedial action. It is estimated that the other properties will not be included on the vicinity property list because their levels of radiation will be within UMTRA Project standards (Appendix A, EPA Standards) or because the elevated levels of radiation at these properties are not due to the Grand Junction tailings. Remedial action is being performed at vicinity properties under the state-operated Grand Junction Remedial Action Program (GJRAP) and the DOE-operated Uranium Mill Tailings Remedial Action (UMTRA) Project. To date more than 200 vicinity properties have already been decontaminated; approximately 3465 vicinity properties will be decontaminated and restored during remedial action of the Grand Junction tailings pile. The impacts of remedial actions at the vicinity properties that would be decontaminated prior to remedial action at the Grand Junction site were examined in DOE (1986).

The principal hazard associated with the tailings results from the production of radon, a radioactive decay product of radium contained in the pile. Radon, a radioactive gas, can diffuse through the pile and be released into the atmosphere where it and its radioactive decay products may be inhaled by humans. If the concentration of radon and its decay products is high enough and the exposure time long enough, health effects (i.e., cancers) may develop in persons living and working near the pile or vicinity properties. If the tailings are not properly stabilized, erosion or human removal of the contaminated materials could spread the contamination over a much wider area and increase the potential public health hazards.

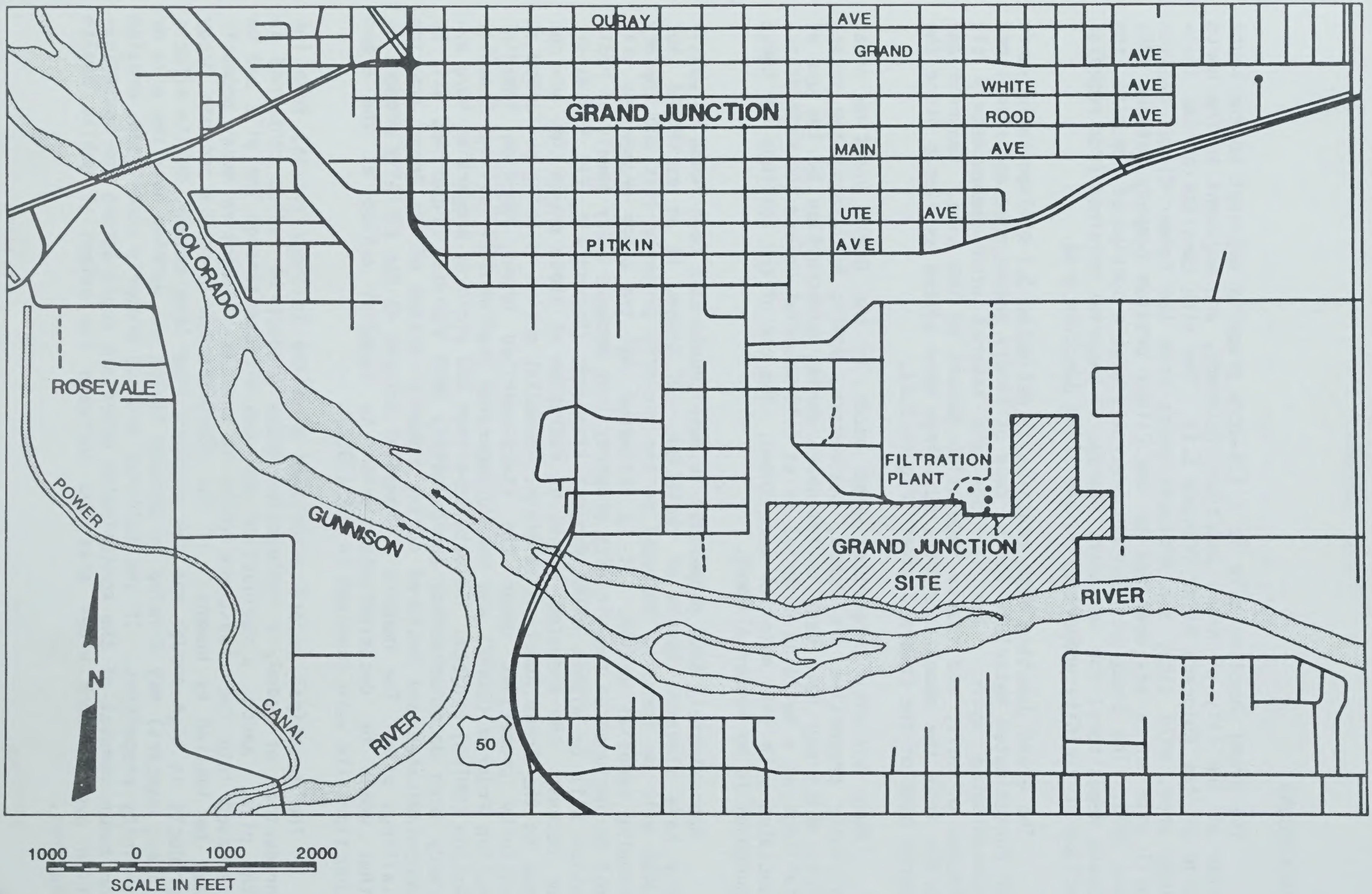


FIGURE 1.1
THE GRAND JUNCTION SITE AND ITS VICINITY

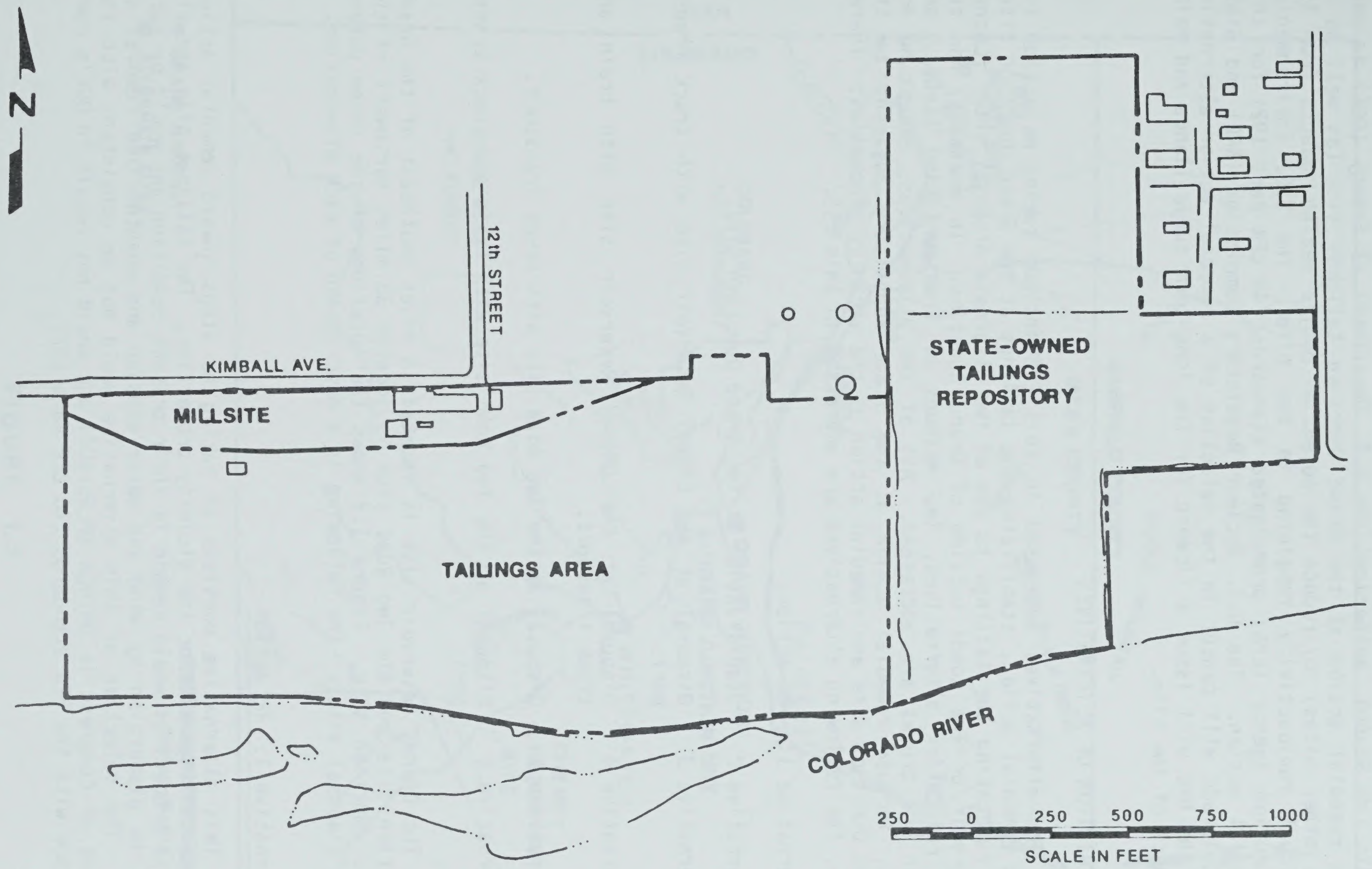


FIGURE 1.2
GRAND JUNCTION SITE MAP

The Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA), Public Law 95-604, authorizes the U.S. Department of Energy (DOE) to perform remedial action at the Grand Junction tailings site (as well as at many other sites) to reduce the potential public health impacts from the residual radioactivity remaining in the pile. The U.S. Environmental Protection Agency (EPA) promulgated standards (40 CFR Part 192) for this remedial action. The U.S. Nuclear Regulatory Commission (NRC) and State of Colorado will concur in the selection of a remedial action alternative and the NRC will issue a license for the long-term surveillance and maintenance of the site.

1.2 DESCRIPTION OF ALTERNATIVES

The alternatives addressed in this EIS include taking no action toward remedial action, stabilizing the tailings at the Grand Junction site, and relocating the tailings to one of two alternate disposal sites (Cheney Reservoir or Two Road) outside of Grand Junction. In addition, for the two relocation alternatives, two methods of transportation (truck, and train and truck) are addressed. All of the alternatives, except no action, include remedial action at the State Repository adjacent to the Grand Junction site and remedial action at the vicinity properties. Therefore, the following alternatives are addressed in this EIS.

Alternative 1 No action.

Alternative 2 Stabilization at the Grand Junction site.

Alternative 3 Disposal at the Cheney Reservoir site with truck transport.

Alternative 4 Disposal at the Cheney Reservoir site with train and truck transport.

Alternative 5 Disposal at the Two Road site with truck transport.

Alternative 6 Disposal at the Two Road site with train and truck transport.

The Cheney Reservoir site is located 18 miles southeast of the Grand Junction site and the Two Road site is located 33 miles northwest of the Grand Junction site. Figure 1.3 shows the locations of the three potential disposal sites. The following is a description of each alternative.

Alternative 1: no action

This alternative consists of taking no steps toward remedial action at the tailings site or the vicinity properties. The tailings pile and vicinity properties would remain in their present condition and would be subject to dispersion by wind and water erosion and unauthorized removal by man. The selection of this alternative would not be consistent with the intent of Congress in UMTRCA (PL95-604) and would not result in DOE's compliance with the EPA standards (40 CFR Part 192).

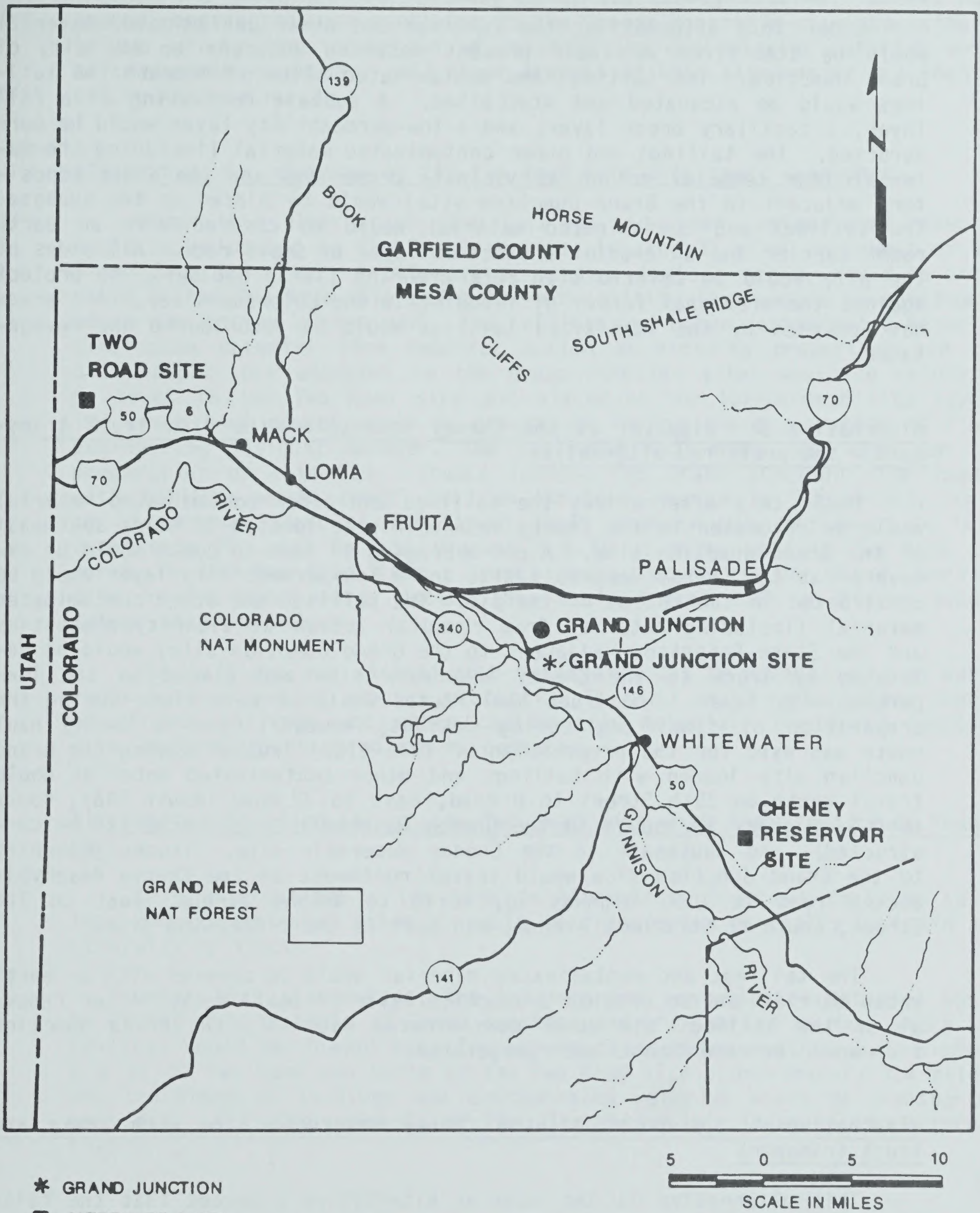


FIGURE 1.3
LOCATION OF DISPOSAL SITES

Alternative 2: stabilization at the Grand Junction site

Under this alternative, the tailings and other contaminated material would be stabilized at their present location adjacent to the city of Grand Junction. The tailings and contaminated alluvium beneath the tailings would be excavated and stockpiled. A subbase consisting of a fill layer, a capillary break layer, and a low-permeability layer would be constructed. The tailings and other contaminated material (including the material from remedial action at vicinity properties and the State Repository adjacent to the Grand Junction site) would be placed on the subbase. The tailings and contaminated material would be covered with an earth radon barrier and an erosion protection layer of small rock. All sides of the pile would be covered with rock armoring (large boulders) to protect against the erosional forces of flooding in the Colorado River. All areas not occupied by the stabilized tailings would be recontoured and revegetated.

Alternative 3: disposal at the Cheney Reservoir site with truck transport - the preferred alternative

Under this alternative, the tailings and other contaminated material would be relocated to the Cheney Reservoir site located 18 miles southeast of the Grand Junction site. A pit averaging 14 feet in depth would be excavated at the Cheney Reservoir site and a low-permeability layer would be constructed in the bottom of the pit. The tailings and other contaminated material (including material from remedial action at vicinity properties and the State Repository adjacent to the Grand Junction site) would be relocated by truck to the Cheney Reservoir site and placed on the low-permeability layer. The truck haul routes would be determined during the preparation of final engineering designs; however, the following haul route was used for the preparation of this EIS. Trucks leaving the Grand Junction site loaded with tailings and other contaminated material would travel north on 15th Street to D Road, east to 32 Road (Route 146), south to U.S. Highway 50, south to the Cheney Reservoir access road (to be constructed), and southeast to the Cheney Reservoir site. Trucks returning to the Grand Junction site would travel northwest on the Cheney Reservoir access road to U.S. Highway 50, north to Noland Avenue, east to 7th Street, south to Struthers Avenue, and east to the processing site.

The tailings and contaminated material would be covered with an earth radon barrier and an erosion protection layer of small rock. After removal of the tailings and other contaminated material, the Grand Junction site would be recontoured and revegetated.

Alternative 4: disposal at the Cheney Reservoir site with train and truck transport

This alternative is the same as Alternative 3 except that the tailings and other contaminated material would be transported partially by train and partially by truck.

Under this alternative, the tailings and contaminated material would be loaded onto a train at the Grand Junction site and transported southeast to Whitewater, where the tailings would be loaded onto trucks and transported south on U.S. Highway 50 to the Cheney Reservoir access road (to be constructed) and southeast to the Cheney Reservoir site approximately two miles. One trainload of tailings and contaminated material would be transported each day. All other aspects of this alternative are identical to Alternative 3.

Alternative 5: disposal at the Two Road site with truck transport

Under this alternative, the tailings and other contaminated material would be relocated to the Two Road site, located 33 miles northwest of the Grand Junction site. A pit, averaging nine feet in depth, would be excavated at the Two Road site and a low-permeability layer would be constructed in the bottom of the pit. The tailings and other contaminated material (including material from remedial action at vicinity properties and the State Repository adjacent to the Grand Junction site) would be relocated by truck to the Two Road site and placed on the low-permeability layer. The truck haul routes would be determined during the preparation of final engineering designs; however, the following haul route was used for the preparation of this EIS. Trucks leaving the Grand Junction site loaded with tailings would travel west on Struthers Avenue to 9th Street, north to Ute Avenue, west to 1st Street (U.S. Highway 50), northwest to U.S. Interstate 70, west to U.S. Highway 6 & 50 at Mack, west to Two Road and north to the Two Road site. Trucks would return to the Grand Junction site by the same route, except they would travel east on Pitkin Avenue rather than Ute Avenue.

The tailings and contaminated material would be covered with an earth radon barrier and an erosion protection layer of small rock. After removal of the tailings and other contaminated material, the Grand Junction site would be recontoured and revegetated.

Alternative 6: disposal at the Two Road site with train and truck transport

This alternative is the same as Alternative 5 except that the tailings and contaminated material would be transported partially by train and partially by truck.

Under this alternative, the tailings and contaminated material would be loaded onto a train at Grand Junction and transported to Mack where the tailings would be loaded onto trucks and transported west on U.S. Highway 6 & 50 to Two Road and north to the Two Road site approximately 3.4 miles. One trainload of tailings and contaminated material would be transported each day. All other aspects of the alternative are identical to Alternative 5.

Remedial action at vicinity properties

All of the alternatives, except no action, include remedial action at an estimated 3465 vicinity properties in Mesa County.

Remedial action at vicinity properties would proceed at an accelerated pace beginning in 1986. Sites with elevated radiation levels would be surveyed and appropriate data collected to determine if they are eligible for inclusion on the list of properties requiring remedial action. The contaminated material would be excavated or otherwise removed (with the consent of the property owner) and transported by trucks to temporary storage at the State Repository adjacent to the Grand Junction site. The contaminated material would be added to and stabilized with the Grand Junction tailings pile. The disturbed areas at the vicinity properties would be restored to approximately their pre-remedial action condition.

Potential for co-disposal with DOE Grand Junction Area Office waste

All of the alternatives, except no action, include the cumulative potential impacts from the co-disposal of the uranium mill tailings wastes which now reside approximately two miles southwest of the Grand Junction mill site at the DOE Grand Junction Area Office (GJAO). The 80,000 cy of tailings wastes (similar to wastes from the Grand Junction mill site) would be relocated to the site selected for disposal of the Grand Junction UMTRA Project tailings. There, the GJAO wastes would be added to the embankment, and covered with the earthern radon barrier and erosion protection layer described for Alternatives 2 through 6. At this time it is not clear whether the GJAO wastes will be subject to RCRA requirements. The DOE is preparing a separate environmental assessment of this remedial action.

1.3 THE AFFECTED ENVIRONMENT

The Grand Junction site and the two alternate disposal sites are in Mesa County, in western Colorado. The Grand Junction site is adjacent to the Colorado River and the city of Grand Junction, which is the largest city in western Colorado and the county seat. This area of Colorado is semiarid, with only about eight inches of precipitation per year, which includes about 27 inches of snow. Temperatures above 100°F or below 0°F are rare, and sunny days usually predominate in all seasons. Winds are most frequently from the southeast or to a lesser extent from the northwest, with an average speed of about eight miles per hour. The region has well-developed railroad and highway systems. The railroad system includes a spur into the Grand Junction site and lines near the alternate sites. Interstate 70 and U.S. Highway 6 & 50 are the major highways connecting Grand Junction with the Two Road site. U.S. Highway 50 is the highway that could be used to transport tailings to the Cheney Reservoir site.

The Grand Junction site is adjacent to the city of Grand Junction and the Colorado River, and south of the tracks of the Denver and Rio Grande Western Railroad. The area around the site is used primarily for industrial purposes but some small residential areas are also nearby. The site lies on unconsolidated alluvial deposits which are underlain by the Mancos Shale. The alluvial deposits contain ground water which may rise into the tailings during periods of high flow in the Colorado River.

The Cheney Reservoir site is approximately 18 miles southeast of Grand Junction and five miles southeast of the community of Whitewater. The site lies between Grand Mesa and the Gunnison River along U.S. Highway 50, which connects Grand Junction with the town of Delta. The site is on

Federal land administered by the BLM. The site is used primarily for low-density grazing. An electric power transmission line crosses the site and another line occurs east of the site. The area about one mile north of the site, along Kannah Creek, is intensely farmed. There is one existing oil and gas lease on the site.

Privately owned land lies to the north, west, and south of the site. The terrain at the site is very flat and the area is sparsely covered with grasses and shrubs. The site lies on 23 to 42 feet of alluvium which is underlain by the Mancos Shale. A very small amount of unconfined, near-surface ground water occurs at the site.

The Two Road site is approximately 33 miles northwest of Grand Junction and 10 miles west of the community of Mack. The site is in Grand Valley, two miles east of the Utah/Colorado border. The site is on Federal land administered by the BLM and is used for low-density grazing. There are a number of oil and gas leases on the site. Privately owned land lies approximately three miles to the south. The terrain at the site is very flat and the area is sparsely covered with grasses. The site lies on 10 to 20 feet of alluvium which is underlain by the Mancos Shale. No near-surface ground water occurs at the site and no major drainages occur near the site.

1.4 SUMMARY OF IMPACTS

The impacts of each remedial action alternative and of remedial action at the vicinity properties are summarized in Table 1.1. All of the alternatives, except no action, include remedial action at the vicinity properties so the impacts in Table 1.1 for the vicinity properties must be added to the impacts of the alternatives to obtain an understanding of the total project-related impacts.

The impacts presented in this EIS are based on conservative assumptions and impact assessment procedures and thereby represent a realistic upper limit on the severity of the impacts that may occur. The actual impacts that would occur would probably be less severe than those identified in this section and elsewhere. The appendices to this EIS and Section 5.0 contain a description of the impact assessment assumptions and procedures. The major impacts of each of the alternatives are described below.

It should be noted that each of the action alternatives was developed using a three-year construction schedule for remedial action. The construction schedule could be extended to four years, or longer, which would decrease the intensity and increase the duration of many of the environmental impacts associated with the project. The primary environmental components affected would be traffic volumes, level of employment, amount of population increase, and air particulate concentrations. The impacts associated with these environmental components would be reduced in intensity by approximately 25 percent if the construction schedule was extended to four years. Regardless of the construction schedule, the impacts presented in this document represent a realistic upper limit.

The no action alternative would leave unchanged the existing unacceptable level of radiation exposure to people in and around Grand Junction from both the tailings pile and 3465 vicinity properties. The tailings

Table 1.1 Summary of impacts

Environmental component	Alternative 1 No action	Alternative 2 Stabilization at Grand Junction	Alternative 3 Disposal at Cheney Reservoir with truck transport	Alternative 4 Disposal at Cheney Reservoir with train-truck transport	Alternative 5 Disposal at Two Road with truck transport	Alternative 6 Disposal at Two Road with train-truck transport	Vicinity Properties[a] For all action alternatives (Alternatives 2 through 6)
Remedial Action Worker Health	None	0.1 cancer fatalities. 0.1 equipment use fatalities.	0.2 cancer fatalities. 0.09 equipment use fatalities.	0.2 cancer fatalities. 0.1 equipment use fatalities.	0.2 cancer fatalities. 0.09 equipment use fatalities.	0.2 cancer fatalities. 0.1 equipment use fatalities.	0.04 cancer fatalities. 0.46 equipment use injuries.
Public Health[b]	About 4 cancer fatalities in 10 years and about 400 cancer fatalities in 1000 years from the pile. 1000 cancer fatalities in 1000 years from vicinity properties	0.7 cancer fatalities in 10 years and about 20 cancer fatalities in 1000 years.	0.6 cancer fatalities in 10 years and about 2 cancer fatalities in 1000 years.	0.6 cancer fatalities in 10 years and about 2 cancer fatalities in 1000 years.	0.6 cancer fatalities in 10 years and about 2 cancer fatalities in 1000 years.	0.6 cancer fatalities in 10 years and about 2 cancer fatalities in 1000 years.	1 cancer fatality during remedial action. No cancer fatalities after remedial action.
Mineral Resources	None	Consumption of 2,149,000 cubic yards of sand, gravel, and rock.	Consumption of 928,000 cubic yards of sand, gravel, and rock.	Same as Alternative 3.	Consumption of 932,000 cubic yards of sand, gravel, and rock.	Same as Alternative 3.	Consumption of 364,000 cubic yards of borrow material (gravel, rock).
Soils	Continuously increasing area of contaminated soils due to wind and water erosion.	Permanent loss of 93 acres of soils. Reclamation of 21 acres of soils.	Permanent loss of 80 acres of soils. Reclamation of 114 acres of soils.	Same as Alternative 3.	Same as Alternative 3.	Same as Alternative 3.	Removal and replacement of 866 acres of soils.
Water Resources	Continued contamination of unused, brackish alluvial ground water in the immediate vicinity of the tailings pile; minimal, diffuse impacts from water contacting the tailings around buried utilities.	Gradual cleansing of unused brackish alluvial ground water. Uranium concentrations in the ground water would stabilize above background levels in 100 years.	No discernible impact at the Cheney Reservoir site. Uranium concentrations in the ground water would stabilize at background levels in 100 years at the Grand Junction site.	Same as Alternative 3.	No impact on ground water resources at the Two Road site. Uranium concentrations in the ground water would stabilize at background levels in 100 years at the Grand Junction site.	Same as Alternative 3.	No impact on ground-water quality.

Table 1.1 Summary of Impacts (Continued)

Environmental component	Alternative 1 No action	Alternative 2 Stabilization at Grand Junction	Alternative 3 Disposal at Cheney Reservoir with truck transport	Alternative 4 Disposal at Cheney Reservoir with train-truck transport	Alternative 5 Disposal at Two Road with truck transport	Alternative 6 Disposal at Two Road with train-truck transport	Vicinity Properties[a] For all action alternatives (Alternatives 2 through 6)
Water Consumption	None	66 million gallons.	73 million gallons.	73 million gallons.	69 million gallons.	70 million gallons.	12 million gallons.
Air Quality (Non-Radiological)	Maximum 24-hour concentration of suspended particulates of 60 micrograms per cubic meter at the Grand Junction site. Within Federal and state standards.	Maximum 24-hour concentration of suspended particulates of 425 micrograms per cubic meter at the Grand Junction site. Exceeds Federal and state standards.	Maximum 24-hour concentration of suspended particulates of 445 micrograms per cubic meter at the Cheney Reservoir site. Exceeds Federal and state standards.	Same as Alternative 3.	Maximum 24-hour concentration of suspended particulates of 353 micrograms per cubic meter along the transportation route. Exceeds Federal and state standards.	Maximum 24-hour concentration of suspended particulates of 331 micrograms per cubic meter at the Two Road site. Exceeds Federal and state standards.	Very small temporary increases in suspended particulates.
Wildlife	None	Permanent loss of 93 acres of disturbed grassland habitat.	Permanent loss of 62 acres of common shrub and grassland habitat.	Same as Alternative 3.	Permanent loss of 62 acres of common grassland habitat.	Same as Alternative 5.	Temporary disturbance of of urban wildlife.
Vegetation	None	Permanent loss of 93 acres of disturbed grasslands.	Permanent loss of 62 acres of common shrubs and grasslands.	Same as Alternative 3.	Permanent loss of 62 acres of common grasslands.	Same as Alternative 5.	None
Threatened and Endangered Species	None	Minor disturbance of wintering bald eagles along the Colorado River.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.	None

Table 1.1 Summary of impacts (Continued)

Environmental component	Alternative 1 No action	Alternative 2 Stabilization at Grand Junction	Alternative 3 Disposal at Cheney Reservoir with truck transport	Alternative 4 Disposal at Cheney Reservoir with train-truck transport	Alternative 5 Disposal at Two Road with truck transport	Alternative 6 Disposal at Two Road with train-truck transport	Vicinity Properties[a] For all action alternatives (Alternatives 2 through 6)
Cultural Resources	None	None	Disturbance of five sites potentially eligible for the NRHP. Data collection and analysis would be conducted.	Same as Alternative 3.	None	None	None likely[c]
Aesthetic Resources	None	Stabilized pile would be 55 to 71 feet above the surrounding terrain - visual annoyance to many persons.	Stabilized pile would be 35 feet above the surrounding terrain and would generally conform with the surrounding terrain.	Same as Alternative 3.	Stabilized pile would be 35 feet above the surrounding terrain and would generally conform with the surrounding terrain.	Same as Alternative 5.	None Properties would be reclaimed to approximately their pre-remedial action condition.
Noise	None	Daytime annoyance to residents near the Grand Junction site.	Daytime annoyance to residents near the Grand Junction site and along transportation route.	Daytime annoyance to residents near the Grand Junction site and at Whitewater.	Daytime annoyance to residents near the Grand Junction site and along the transportation route.	Daytime annoyance to residents near the Grand Junction site and at Mack.	Short-term daytime annoyance to property owner and adjacent residents.

Table 1.1 Summary of impacts (Continued)

Environmental component	Alternative 1 No action	Alternative 2 Stabilization at Grand Junction	Alternative 3 Disposal at Cheney Reservoir with truck transport	Alternative 4 Disposal at Cheney Reservoir with train-truck transport	Alternative 5 Disposal at Two Road with truck transport	Alternative 6 Disposal at Two Road with train-truck transport	Vicinity Properties[a] For all action alternatives (Alternatives 2 through 6)
Land Use	Continued restricted use of 114 acres at the Grand Junction site and adjacent State Repository.	Permanent restricted use of 93 acres at the Grand Junction site and adjacent State Repository. Release of 21 acres for other uses.	Permanent restricted use of 80 acres at the Cheney Reservoir site. Release of 114 acres at the Grand Junction site for other uses.	Same as Alternative 3.	Permanent restricted use of 80 acres at Two Road site which would preclude use of of the site for the Glenwood-Dotsero desalination project.	Same as Alternative 5.	None
Population	None	Increase in population of about 300 persons in Grand Junction and about 500 persons in Mesa County during maximum site activities.	Increase in population of about 320 persons in Grand Junction and about 560 persons in Mesa County during maximum site activities.	Increase in population of about 330 persons in Grand Junction and about 560 persons in Mesa County during maximum site activities.	Increase in population of about 360 persons in Grand Junction and about 600 persons in Mesa County during maximum site activities.	Increase in population of about 360 persons in Grand Junction and about 610 persons in Mesa County during maximum activities.	Increase in population of about 600 persons in Grand Junction and about 960 persons in Mesa County during maximum site activities.
Employment	None	Average direct employment of 125 persons for 33 months. Maximum direct employment of 185 persons. 75 percent local labor.	Average direct employment of 128 persons for 34 months. Maximum direct employment of 146 persons. 75 percent local labor.	Average direct employment of 112 persons for 34 months. Maximum direct employment of 127 persons. 75 percent local labor.	Average direct employment of 127 persons for 34 months. Maximum direct employment of 147 persons. 75 percent local labor.	Average direct employment of 118 persons for 34 months. Maximum direct employment of 136 persons. 75 percent local labor.	Average direct employment of 495 persons for 27 months. Maximum direct employment of 815 persons. 75 percent local labor.

Table 1.1 Summary of impacts (Concluded)

Environmental component	Alternative 1 No action	Alternative 2 Stabilization at Grand Junction	Alternative 3 Disposal at Cheney Reservoir with truck transport	Alternative 4 Disposal at Cheney Reservoir with train-truck transport	Alternative 5 Disposal at Two Road with truck transport	Alternative 6 Disposal at Two Road with train-truck transport	Vicinity Properties[a] For all action alternatives (Alternatives 2 through 6)
Social Services	None	The Grand Junction and Mesa County school, sewer, water, power, fire, and police facilities are adequate to accommodate the increased population.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.
Transportation Networks	None	Maximum of 45 percent increase in traffic on D Road during maximum site activities. Some congestion and road maintenance.	Maximum of 32 percent increase in traffic on U.S. Highway 50 during maximum site activities. Some congestion and road maintenance.	Maximum of 11 percent increase in traffic on U.S. Highway 50 during maximum site activities.	Maximum of 64 percent increase in traffic on U.S. Highway 6 & 50 during site activities. Some congestion and road maintenance.	Maximum of 38 percent increase in traffic on U.S. Highway 6 & 50 during maximum site activities.	80 truck trips per day from various locations in Mesa County - no discernible impacts.
Traffic Accidents	None	4.50 injuries 0.09 fatalities	8.77 injuries 0.26 fatalities	4.22 injuries 0.14 fatalities	11.47 injuries 0.38 fatalities	6.06 injuries 0.17 fatalities	2.85 injuries 0.08 fatalities
Energy Resources	None	Consumption of 3.2 million gallons of fuel and 1.8 million kwh of electricity.	Consumption of 5.0 million gallons of fuel and 1.3 million kwh of electricity.	Consumption of 5.1 million gallons of fuel and 1.3 million kwh of electricity.	Consumption of 5.1 million gallons of fuel and 1.4 million kwh of electricity.	Consumption of 6.8 million gallons of fuel and 1.4 million kwh of electricity	Consumption of 1.7 million gallons of fuel and 0.01 million kwh of electricity.
Costs	None	$65 million	$56 million	$93 million	$77 million	$107 million	$99 million

Note: Some numbers in this summary table have been ruunded and, therefore, differ slightly from numbers in the text.

[a]Alternatives 2 through 6 include remedial action at the vicinity properties; impacts listed for the vicinity properties must be added to the impacts of each alternative to identify the impacts of the entire project.
[b]Assumes a constant population. Increase in population would cause a greater increase in health impacts for no action and stabilization at the Grand Junction site than for the other alternatives because the Cheney Reservoir and Two Road sites are in more remote locations.
[c]Historic surveys would be conducted for all buildings over 50 years old and the State Historic Preservation Officer would be consulted (as necessary).

would continue to be subject to wind and water erosion which would result in a continuously expanding area contaminated with radioactive wastes. In addition, the 114 acres which comprise the tailings site and the State Repository would be unavailable for industrial or recreational uses. This alternative would not be consistent with the intent of Congress in UMTRCA (PL95-604) and would not result in compliance with the EPA standards (40 CFR Part 192).

Stabilization at the Grand Junction site would reduce radiation releases to EPA standards. This alternative would prevent the use of 93 acres at the Grand Junction site from other productive land uses such as industrial and recreational development. This alternative would cause Federal and state 24-hour standards for the release of particulates (dust) to be exceeded during construction activities at the Grand Junction site and may cause Federal and state annual standards to be exceeded. Noise generated by construction equipment would disturb residents living near the site during the daytime. There would be a substantial increase in traffic (prima ly trucks) on city streets around the Grand Junction site and on D Road and State Highway 146 with an associated increase in traffic congestion, accidents, and road maintenance. This alternative would cause a substantial increase in direct employment and an increase in the population of Grand Junction. The direct monetary costs of this alternative would be $65.38 million.

Disposal at the Cheney Reservoir site with truck transport would reduce the radiation releases to EPA standards and stabilize the pile in a relatively remote area. The 114 acres that comprise the Grand Junction site would be decontaminated and released for other productive land uses. Eighty acres at the Cheney Reservoir site, presently used for low-density grazing, would be used for tailings disposal. This alternative would cause Federal and state 24-hour standards for the release of particulates to be exceeded during construction activities at both the Grand Junction and Cheney Reservoir sites and may cause Federal and state annual standards to be exceeded. Noise generated by construction equipment would disturb residents living near the Grand Junction site and along the transportation routes during the daytime. There would be a substantial increase in traffic (primarily trucks) on city streets around the Grand Junction site, on D Road, State Highway 146, and U.S. Highway 50 between Grand Junction and the Cheney Reservoir site. An increase in traffic congestion, accidents, and road maintenance would accompany the increase in traffic. This alternative would cause a substantial increase in direct employment and an increase in the population of Grand Junction. The direct monetary costs of this alternative would be $56.30 million.

Disposal at Cheney Reservoir with train and truck transport would have the same impact as disposal at Cheney Reservoir with truck transport except that there would be a much smaller impact on traffic congestion, accidents, and road maintenance and a large increase in direct monetary costs. The major increases in traffic would primarily occur on U.S. Highway 50 between Whitewater and the Cheney Reservoir site. The direct monetary costs would increase by 65 percent over disposal at the Cheney Reservoir site with truck transport.

Disposal at the Two Road site with truck transport would reduce the radiation releases to EPA standards and stabilize the pile in a relatively remote area. The 114 acres which comprise the Grand Junction site would be decontaminated and released for other productive land uses. Eighty acres at the Two Road site, presently used for low-density grazing, would be used for tailings disposal. This alternative would cause Federal and state 24-hour standards for the release of particulates to be exceeded during construction activities at both the Grand Junction and Two Road sites and may cause Federal and state annual standards to be exceeded. Noise generated by construction equipment would disturb residents living near the Grand Junction site and along the transportation routes during the daytime. There would be a substantial increase in traffic (primarily trucks) on city streets around the Grand Junction site, Interstate 70 between Grand Junction and Mack, and U.S. Highway 6 & 50 between Mack and the Two Road site. An increase in traffic congestion, accidents, and road maintenance would accompany the increase in traffic. This alternative would cause a substantial increase in direct employment and an increase in the population of Grand Junction. The direct monetary costs of this alternative would be $77.48 million.

Disposal at Two Road with train and truck transport would have the same impacts as disposal at Two Road with truck transport except that there would be a much smaller impact on traffic congestion, accidents, and road maintenance and a large increase in direct monetary costs. The major increases in traffic would primarily occur on U.S. Highway 6 & 50 between Mack and the Two Road site. The direct monetary costs would increase by 38 percent over disposal at the Two Road site with truck transport.

All of the alternatives, except no action, include remedial action at 3465 vicinity properties. The primary impacts include disturbance of nearby residents from noise, possible temporary relocation of some residents, and possible temporary closing of some businesses. Although impacts on ground-water quality may result from tailings around storm sewers, water lines, and irrigation canals, these impacts will probably be minor and diffuse. Remedial action at vicinity properties would cause a substantial increase in direct and indirect employment and an increase in the population of Grand Junction. The direct monetary costs would be $99.36 million.

REFERENCES FOR SECTION 1.0

DOE (U.S. Department of Energy), 1986. Environmental Assessment of Remedial Action at the Vicinity Properties Associated with the Former Climax Uranium Company Uranium Mill Site, Grand Junction, Mesa County, Colorado, DOE/EA-0311, prepared by the U.S. Department of Energy, UMTRA Project Office, Albuquerque Operations Office, Albuquerque, New Mexico.

2.0 PURPOSE AND NEED

2.1 INTRODUCTION

In response to public concern over the potential public health hazards associated with uranium mill tailings and the associated contaminated material left abandoned or otherwise uncontrolled at inactive processing sites throughout the United States, Congress passed the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA), Public Law 95-604, which was enacted into law on November 8, 1978. In UMTRCA, Congress acknowledged the potential health hazards associated with uranium mill tailings and identified 24 sites that were in need of remedial action. The Grand Junction site is one of these 24 sites.

The principal hazard associated with the tailings results from the production of radon, a radioactive decay product of the radium contained in the pile. Radon, a radioactive gas, can diffuse through the pile and be released into the atmosphere where it and its radioactive decay products may be inhaled by humans. If the concentration of radon and its decay products is high enough and the exposure time long enough, cancers may develop in persons living and working near the pile. If the tailings are not properly stabilized, erosion or human removal of the contaminated materials could spread the contamination over a much wider area and increase the potential public health hazards.

Title I of UMTRCA authorizes the U.S. Department of Energy (DOE) to enter into cooperative agreements with affected states and Indian tribes to clean up those inactive sites contaminated with uranium mill tailings, requires the Secretary of the DOE to designate sites to be cleaned up, requires the U.S. Environmental Protection Agency (EPA) to promulgate standards for these sites, and defines the role of the U.S. Nuclear Regulatory Commission (NRC).

Effective October 19, 1981, the DOE and the State of Colorado entered into a cooperative agreement under UMTRCA. The cooperative agreement sets forth the terms and conditions for the DOE and the state cooperative remedial action efforts including the DOE's development of a remedial action plan (with the concurrence of the state), the preparation of an appropriate environmental document, real estate responsibilities, and other concerns.

2.2 EPA STANDARDS

The EPA published an Environmental Impact Statement (EIS) (EPA 520/4-82-013-2) on the development and impacts of the standards (40 CFR Part 192) and issued final standards (48 FR 590-604) on January 5, 1983, to become effective on March 7, 1983. In developing these standards, EPA determined "that the primary objective for control of tailings should be isolation and stabilization to prevent their misuse by man and dispersal by natural forces" and that "a secondary objective should be to reduce the radon emissions from the piles." A third objective should be "the elimination of significant exposure to gamma radiation from tailings piles."

On September 3, 1985, the United States Tenth Circuit Court of Appeals set aside EPA's water protection standards, 40 CFR Part 192.20(a)(2)-(3), and EPA has not yet reissued these standards. When EPA issues revisions to the water protection standards, DOE will re-evaluate the ground-water issues at the site to assure that the revised standards are met. Performing remedial actions to stabilize the tailings prior to EPA issuing new standards will not affect the measures that are ultimately required to meet the revised water protection EPA standards.

Appendix A, EPA Standards, contains a detailed discussion of the standards.

2.3 NRC LICENSING

All remedial actions performed under the UMTRCA must be performed in accordance with EPA standards and with the concurrence of the NRC. The NRC has not and does not intend to issue regulations applicable to the remedial actions at the inactive uranium processing sites but will issue licenses for the long-term surveillance and maintenance (including monitoring) of the disposal site after the cleanup work is complete. These licenses may require the DOE or other Federal agency having custody of the site to perform such surveillance, maintenance, and contingency measures as necessary to ensure continued compliance with the EPA standards. Section 5.21 contains additional details on the surveillance and maintenance of UMTRA Project sites.

3.0 ALTERNATIVES FOR THE REMEDIAL ACTION

3.1 INTRODUCTION

3.1.1 The Grand Junction tailings and vicinity properties

The Climax Uranium Company processed uranium and vanadium ore at the Grand Junction mill site from June, 1951, to March, 1970. The mill produced 2.2 million tons of tailings, of which approximately 300,000 tons were removed and used as construction material and for landfill around Mesa County before the hazard associated with these materials was known. These properties are termed "vicinity properties."

The contaminated area at the Grand Junction site covers approximately 114 acres as shown below.

o Tailings pile -	57 acres.
o Mill yard and ore storage pad -	18 acres.
o State Repository -	39 acres.
o Total -	114 acres.

The State Repository, located adjacent to the east side of the Grand Junction site, is used for temporary storage of the contaminated material obtained from remedial action at vicinity properties. Remedial action at the vicinity properties is presently being conducted under the state-operated Grand Junction Remedial Action Program (GJRAP) and under the UMTRA Project operated by the U.S. Department of Energy (DOE).

The total volume of contaminated materials associated with the Grand Junction site is estimated to be 3.1 million cubic yards, as shown below.

Item	Volume in cubic yards
Tailings.	1.80 million
Contaminated alluvium beneath the tailings.	0.38 million
Other contaminated materials (including material at vicinity properties, the State Repository, mill site, evaporation ponds, and building rubble).	0.92 million
Total	3.10 million

Contamination exists in the materials listed below to the average depths indicated:

- o Alluvium beneath the tailings - 4.5 feet.
- o Soils in the former mill yard - five feet.
- o Soils in the former evaporation ponds - one foot.
- o Soils at the former ore pad - 1.5 feet.
- o Vicinity properties material at the State Repository - 10.5 feet.

The tailings consist of finely ground ore residues (80 percent sands, the coarser fraction left after milling, and 20 percent slimes) and the chemicals used to process the ore. Roughly rectangular, the tailings pile measures about 1000 feet along its western and eastern boundaries and 2500 feet along its northern and southern boundaries. The western end of the pile is almost flat; the eastern end is shaped like a cone that rises about 30 feet above the western part of the pile. The bottom of the pile is three to six feet above the average level of the Colorado River.

Shortly after the mill was shut down, efforts were made to stabilize the pile. Much of the concrete and brick from the demolished mill buildings was placed as riprap along the river. The rest was placed on the settling ponds, which were then contoured with an estimated 174,000 tons of tailings transferred from the tailings pile. The tailings pile was covered to a minimum thickness of six inches with 87,000 cubic yards of soil. The pile was revegetated and irrigated for some time; however, little vegetation exists now. The entire tailings area is fenced to control access.

Approximately 6905 properties in Mesa County have been found to possibly have elevated levels of radiation. Of these, it is estimated that 3465 will be formally included on the vicinity property list and thereby require remedial action. It is estimated that the other properties will not be included on the vicinity property list because their levels of radiation will be within UMTRA Project standards (Appendix A, EPA Standards) or because the elevated levels of radiation at these properties are not due to the Grand Junction tailings. Remedial action is being performed at vicinity properties under the state-operated Grand Junction Remedial Action Program (GJRAP), the DOE-operated UMTRA Project, and by individual property owners. Approximately 200 vicinity properties have already been decontaminated and an additional 3465 properties would be decontaminated during remedial action of the Grand Junction tailings pile. An environmental report was prepared in 1982 to assess the impacts of remedial action at these vicinity properties and an environmental assessment has been prepared to address the impacts of those vicinity properties that would be decontaminated prior to remedial action at the Grand Junction tailings pile (DOE, 1986).

3.1.2 Alternatives addressed

The alternatives addressed in this document include taking no action toward remedial action, stabilizing the tailings at the Grand Junction site, and relocating the tailings to one of two alternate disposal sites (Cheney Reservoir or Two Road) outside of Grand Junction. In addition, for the two relocation alternatives, two methods of transportation (truck, and train and truck) are addressed. Therefore, the following alternatives are addressed in this EIS.

Alternative 1	No action.
Alternative 2	Stabilization at the Grand Junction site.
Alternative 3	Disposal at the Cheney Reservoir site with truck transport.
Alternative 4	Disposal at the Cheney Reservoir site with train and truck transport.
Alternative 5	Disposal at the Two Road site with truck transport.
Alternative 6	Disposal at the Two Road site with train and truck transport.

The Cheney Reservoir site is located 18 miles southeast of the Grand Junction site and the Two Road site is located 33 miles northwest of the Grand Junction site. Figure 1.3 shows the location of the three potential disposal sites. All of the alternatives, except no action, include remedial action at the State Repository adjacent to the Grand Junction site and remedial action at the vicinity properties.

It should be noted that each of the action alternatives was developed using a three-year construction schedule for remedial action. The construction schedule could be extended to four years, or longer, which would decrease the intensity and increase the duration of many of the environmental impacts associated with the project. The primary environmental components affected would be traffic volumes, level of employment, amount of population increase, and air particulate concentrations. The impacts associated with these environmental components would be reduced in intensity by approximately 25 percent if the construction schedule was extended to four years. Regardless of the construction schedule, the impacts presented in this document represent a realistic upper limit.

3.2 DESCRIPTION OF ALTERNATIVES

3.2.1 Background

All of the alternatives, except no action, have been designed to comply with the EPA standards shown in Appendix A, EPA Standards. Consistent with these standards, the following major design objectives have been established:

- o Reduce the average radon flux from the site to levels consistent with EPA standards.
- o Design controls to be effective for up to 1000 years to the extent reasonably achievable, and, in any case, for at least 200 years.
- o Ensure that existing or anticipated beneficial uses of ground and surface waters are not adversely affected.
- o Reduce contaminant levels (radium-226) in areas released for unrestricted use to levels consistent with EPA standards.
- o Reduce radiation levels in habitable buildings to levels consistent with EPA standards.
- o Minimize the land area to be occupied by the stabilized tailings.
- o Provide flood protection, runoff and sediment control, and treatment of waste water as required.
- o Prevent inadvertent human intrusion into the stabilized tailings.
- o Minimize animal burrowing and root penetration into the stabilized tailings.
- o Protect against releases of contaminants from the site during construction.
- o Minimize areas disturbed during construction and minimize human exposure to contaminated materials.

Appendix B, Engineering Designs, and Sections 3.2.2 through 3.2.9 of this chapter contain additional details on the remedial action designs. Appendix C, Alternatives Eliminated from Detailed Study, and Section 3.3 of this chapter describe how the alternate sites were selected.

3.2.2 Alternative 1: no action

This alternative consists of taking no steps toward remedial action at the tailings site or the vicinity properties. The tailings pile and vicinity properties would remain in their present location and the contaminated materials would be subject to dispersion by wind and water erosion and unauthorized removal by man. The selection of this alternative would not be consistent with the intent of Congress in UMTRCA (PL95-604) and would not result in DOE's compliance with the EPA standards (40 CFR Part 192).

In order to demonstrate the potential hazards associated with the tailings and therefore the need to perform remedial action, an intruder analysis was performed to define the potential severity of the hazard associated with the tailings and the need to restrict access to the stabilized tailings. If a person were to build a home on the tailings pile, raise all his food on the pile, and consume contaminated water from beneath the pile, that person would have a 20 percent chance of dying from cancer during a 70-year lifetime as a result of radioactivity in the tailings. Additional details on the risk assessment are contained in Appendix I, Radiation Health Effects.

3.2.3 Alternative 2: stabilization at the Grand Junction site

Introduction

Under this alternative, the tailings and other contaminated material would be stabilized at their present location adjacent to the city of Grand Junction. The tailings and contaminated or structurally unstable alluvium beneath the tailings would be excavated and stockpiled. A subbase consisting of a fill layer, a capillary break layer, and a low-permeability layer would be constructed. The tailings and other contaminated material (including the material from remedial action at vicinity properties and the State Repository adjacent to the Grand Junction site) would be placed on the subbase. The tailings and contaminated material would be covered with an earth radon barrier and an erosion protection layer of small rock. All sides of the pile would be covered with rock armoring (large boulders) to protect against the erosional forces of flooding in the Colorado River. All areas not occupied by the stabilized tailings would be recontoured and revegetated. All vicinity properties which meet the DOE inclusion requirements would be cleaned up. Appendix B, Engineering Designs, contains additional details on the remedial action design. Appendix L, Vicinity Property Report, and Section 3.2.9 contain additional information on remedial action at the vicinity properties.

Major construction activities

This alternative would require the following major construction activities:

At the Grand Junction site

- Construction of waste-water retention basins (evaporation ponds) to protect against release of contaminants from the site during remedial action.

- Installation of temporary security fencing.

- o Construction of drainage control measures to direct all generated waste-water and storm-water runoff to the retention basins during construction activities.

- o Implementation of measures to control erosion and sedimentation from disturbed areas during construction.

- o Installation and operation of a waste-water treatment facility (if necessary) at the Grand Junction processing site to protect against inadvertent release of contaminants during construction.

- o Protection (or relocation) of surface or subsurface utilities at the Grand Junction site during construction.

- o Installation of sheet-piling (if necessary) along the south and portions of the southwest and southeast perimeters of the existing pile to retard surface flows from the Colorado River and ground-water intrusion during excavation.

- o Installation of soldier piling along the northern site perimeter to facilitate excavation of contaminated material adjacent to the site boundary.

- o Excavation and stockpiling of tailings and contaminated alluvial material.

- o Excavation of any low strength foundation material beneath the tailings and replacement with compacted, coarser grained fill.

- o Construction of the tailings subbase, including fill layer, capillary break layer, low-permeability layer, and below-grade rock armor layer. Borrow material needed for the construction of the subbase, radon barrier, and erosion protection barrier would be obtained from existing borrow sites near the Grand Junction site and a new borrow site in Unaweep Canyon (Section 3.2.8).

- o Replacement of tailings and contaminated alluvium over the low-permeability layer.

- o Relocation to the tailings embankment area of site tailings and other contaminated materials (including State Repository and vicinity property material).

- o Disposal of waste-water retention basin and temporary drainage ditch sediments in the embankment.

- o Construction of a final cover system over the tailings and contaminated material to inhibit water infiltration and radon exhalation.

- o Placement of rock to inhibit intrusion by burrowing animals and to provide erosion protection of the embankment, with final grading to provide suitable drainage control.

- o Placement of a rock armor layer over the embankment to protect the pile from the effects of a Probable Maximum Flood (PMF) of the Colorado River.
- o Restoration of excavated areas with backfill and vegetation.
- o Installation of permanent barriers and warning signs to discourage inadvertent human intrusion.

At the 32 and C½ borrow site (see Section 3.2.8, Borrow sites)

- o Excavation of erosion protection and cover material and loading onto trucks.
- o Relocation of borrow material to the Grand Junction processing site.

At the Unaweep Canyon borrow site (see Section 3.2.8, Borrow sites)

- o Excavation of rock armor material by traditional drill and blast methods and loading onto trucks.
- o Relocation of borrow material to the Grand Junction processing site.
- o Reclamation of the site according to applicable requirements.

Major design considerations

The major design considerations include providing for the control of radon emissions, long-term stability, and ground-water protection. These considerations are discussed below and additional details are contained in Appendix B, Engineering Designs, Appendix F, Hydrology Report, and Appendix I, Radiation Health Effects.

Radon emissions from the stabilized pile would be controlled by the construction of a compacted earth barrier over the tailings and other contaminated materials. The radon emissions would meet EPA standards. The thickness of the earth barrier was estimated using data on the distribution of radium in the tailings pile, data on the physical properties of the earth cover material, and a computer model (RAECOM). A five-foot-thick cover was assumed for use in this EIS. This thickness could be reduced, and still meet EPA standards, by placing lesser contaminated material on top of the tailings prior to the placement of the radon barrier or by the selection of other material as a source of the radon cover.

The principal features affecting the long-term stability of the stabilized pile include erosion from a major rainfall event, flooding, river meander, and slope stability. The pile has been designed to withstand the erosive forces of a Probable Maximum Precipitation (PMP) through the construction of a two-foot-thick rock cover over the stabilized pile and contouring the pile with a maximum of four percent slopes on the top of the pile and 20 percent slopes on the sides of the pile.

The stabilized pile would be protected against erosion during flooding or by river meander by the construction of a six-foot-thick layer of rock armoring around all sides of the pile. The rock would have a mean diameter of 20 to 30 inches. The armoring would extend from a point below the calculated level of maximum scour that would occur during a Probable Maximum Flood (PMF) to above the estimated maximum water level during a PMF.

Protection against slope failure would be provided by excavating and removing the low strength material beneath the tailings and by constructing the tailings embankment with gentle slopes as described above. The stabilized pile would not fail during a Maximum Credible Earthquake (MCE).

Protection of the ground water would be provided by excavating the tailings and contaminated material beneath the tailings and placing a layer of fill material to provide a base for the tailings that is above the ground-water level. A capillary break layer would be constructed on top of the fill layer to prevent the upward migration of ground water. A low-permeability layer would be constructed on top of the capillary break layer to inhibit the downward migration of contaminated water from the tailings. In addition, the compacted radon barrier that would be placed over the tailings would inhibit the infiltration of rainfall and runoff through the tailings pile.

Construction estimates and schedule

This alternative would require an estimated 33 months to complete. Employment would reach an estimated maximum of approximately 185 persons in the ninth month of the project and would average approximately 125 persons over the life of the project.

The project would consume an estimated 3.247 million gallons of fuel, 1.768 million kwh of electricity, and 66.41 million gallons of water.

This alternative would cost an estimated $65.38 million. The costs of property acquisition, engineering designs, overall project management, remedial action at vicinity properties, and long-term surveillance and maintenance are not included in these costs.

Appendix B, Engineering Designs, contains additional details on the construction estimates and costs for this alternative, and Section 3.2.9 contains construction estimates and costs for remedial action at the vicinity properties.

Description of final condition

The stabilized tailings pile would be roughly rectangular in shape with a pointed east end (Figure 3.1). The pile would cover approximately 72 acres. The final restricted area, within the security fence, would encompass approximately 93 acres. The stabilized pile would be covered with an approximately five-foot-thick earth cover. The stabilized pile would have maximum sideslopes of 20 percent (5 horizontal to 1 vertical) and the top would be gently sloped (a maximum of four percent) toward the river (Figure 3.2). The entire embankment would be covered with a two-foot layer (including filter layers) of graded rock for erosion protection. The final stabilized pile would be a maximum of 55 feet above the terrain on the north side of the stabilized tailings.

An erosion protection barrier would tie into a rock armor wall around the base of the tailings. An unpaved access road would be constructed around the base of the pile on top of the rock armoring, and a drainage ditch would be constructed around the outside edge of the rock armoring on the east, west, and north sides of the pile. The ditch would divert surface-water runoff around and away from the pile. A security fence with locked gates and warning signs would enclose the pile, access road, and drainage ditch.

The remaining areas at the Grand Junction site would be restored with uncontaminated fill to conform with the surrounding terrain, graded to promote drainage, and revegetated. The 93 acres comprising the stabilized tailings would be permanently restricted from any other uses. The remaining 21 acres of the present site would be released for any uses consistent with local land use plans.

All vicinity properties which meet DOE inclusion requirements would be cleaned up (Section 3.2.9) and the contaminated material would be added to the tailings pile.

3.2.4 Alternative 3: disposal at the Cheney Reservoir site with truck transport - the preferred alternative

Introduction

Under this alternative, the tailings and other contaminated material would be relocated to the Cheney Reservoir site, located 18 miles southeast of the Grand Junction site. A pit averaging 14 feet in depth would be excavated at the Cheney Reservoir site and a low-permeability layer would be constructed in the bottom of the pit. The tailings and other contaminated material (including material from remedial action at vicinity properties and the State Repository adjacent to the Grand Junction site) would be relocated by truck to the Cheney Reservoir site and placed on the low-permeability layer.

The truck haul routes would be determined during the preparation of final engineering designs; however, the following haul

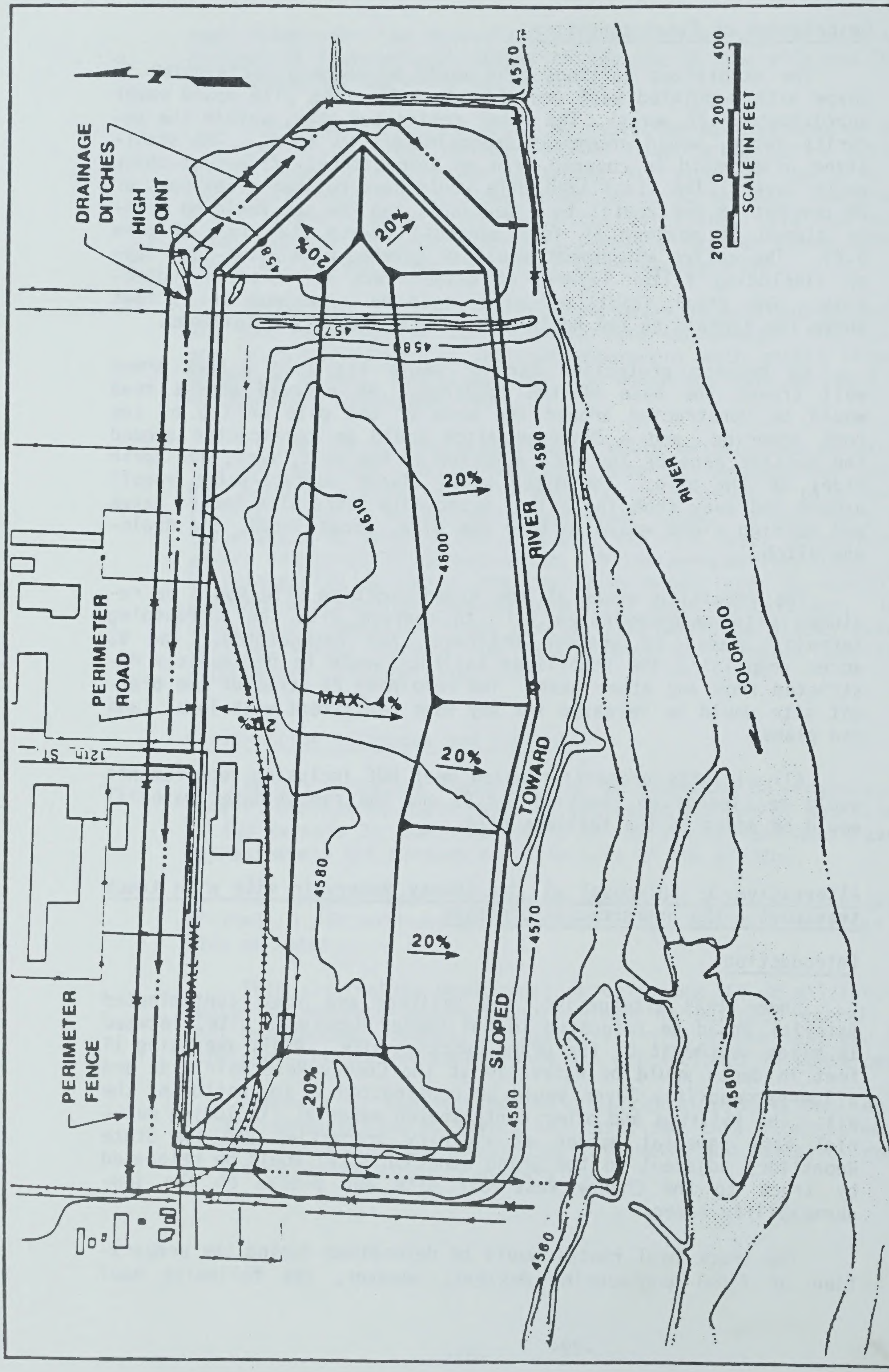


FIGURE 3.1
FINAL CONDITION – STABILIZATION ON SITE

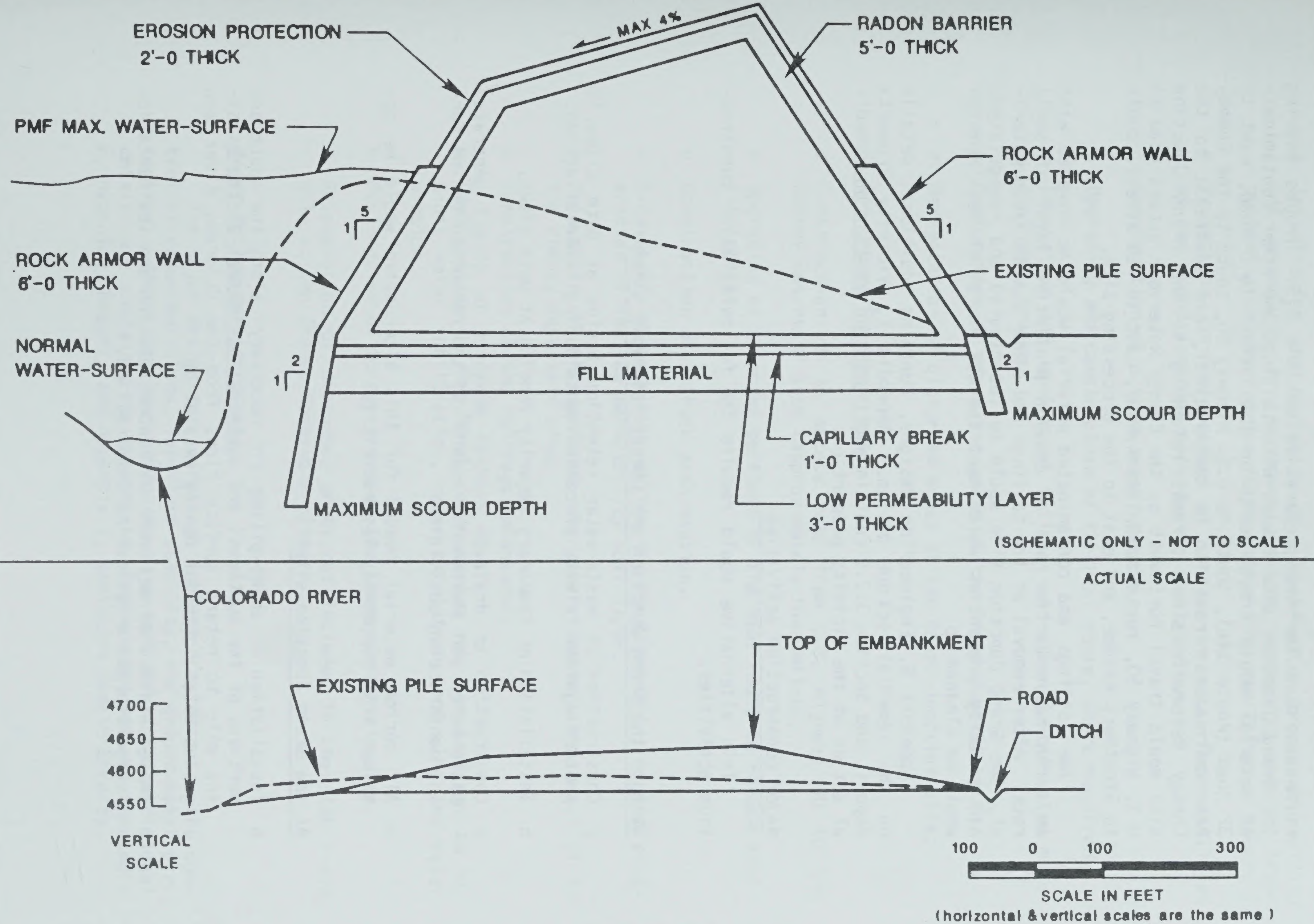


FIGURE 3.2
TYPICAL CROSS-SECTION - STABILIZATION ON SITE

route was used for the preparation of this EIS. Trucks leaving the Grand Junction site loaded with tailings and other contaminated material would travel north on 15th Street to D Road, east to 32 Road (Route 146), south to U.S. Highway 50, south to the Cheney Reservoir access road (to be constructed), and southeast to the Cheney Reservoir site. Trucks returning to the Grand Junction site would travel northwest on the Cheney Reservoir access road to U.S. Highway 50, north to Noland Avenue, east to 7th Street, south to Struthers Avenue, and east to the processing site.

The tailings and contaminated material would be covered with an earth radon barrier and an erosion protection layer of small rock. After removal of the tailings and other contaminated material, the Grand Junction site would be recontoured and revegetated. All vicinity properties which meet the DOE inclusion requirements would be cleaned up.

Appendix B, Engineering Designs, contains additional details on the remedial action design. Appendix L, Vicinity Property Report, and Section 3.2.9 contain additional information on remedial action at the vicinity properties.

Major construction activities

This alternative would require the following major construction activities.

At both the Grand Junction and Cheney Reservoir sites

- Construction of waste-water retention basins at both sites to protect against release of contaminants during remedial action.
- Installation of temporary security fencing at both sites.
- Construction of drainage control measures to direct generated waste-water and storm-water runoff to the retention basins during construction activities.
- All borrow material needed for this alternative would be obtained from the Cheney Reservoir site.

At the Grand Junction site

- Installation of sheet-piling (if necessary) along the south and portions of the southwest and southeast perimeters of the existing pile to retard surface flows from the Colorado River and ground-water intrusion during excavation.
- Implementation of measures to control erosion and sedimentation from disturbed areas during construction.

- o Installation and operation of a waste-water treatment facility (if necessary) at the Grand Junction processing site to treat contaminated water prior to discharge into the Colorado River.
- o Protection (or relocation) of surface or subsurface utilities at the Grand Junction site during construction.
- o Construction of a truck wash station.
- o Upgrading and construction of the haul route, where required.
- o Excavation and loading of tailings and other contaminated material onto trucks.
- o Restoration of excavated areas at the Grand Junction site.
- o Revegetation of disturbed areas at the Grand Junction site.

At the Cheney Reservoir site

- o Construction of an access road from U.S. Highway 50 to the Cheney Reservoir site (approximately four miles).
- o Upgrading of selected portions of the haul route to reduce traffic impacts.
- o Construction of a truck wash station.
- o Excavation of materials at the Cheney Reservoir site and preparation of the low-permeability soil layer.
- o Relocation of the tailings and other contaminated material to the Cheney Reservoir site.
- o Construction of the tailings embankment.
- o Construction of the final cover system over the tailings to inhibit water infiltration, radon exhalation, and wind and water erosion.
- o Restoration of borrow areas at the Cheney Reservoir site.
- o Revegetation of disturbed areas not included in the stabilized pile at the Cheney Reservoir site.

Major design considerations

The major design considerations include providing for the control of radon emissions, long-term stability, and ground-water protection. These considerations are discussed below and additional details are contained in Appendix B, Engineering Designs, Appendix F, Hydrology Report, and Appendix I, Radiation Health Effects.

Radon emissions from the stabilized pile would be controlled by the construction of a compacted earth barrier over the tailings and other contaminated materials. The radon emissions would meet EPA standards. The thickness of the earth barrier was estimated using data on the distribution of radium in the tailings pile, data on the physical properties of the earth cover material, and a computer model (RAECOM). A five-foot-thick cover was assumed for use in this EIS. This thickness could be reduced, and still meet EPA standards, by placing lesser contaminated material on top of the tailings prior to the placement of the radon barrier or by the selection of other material as a source of the radon cover.

The principal features affecting the long-term stability of the stabilized pile include erosion from a major rainfall event, flooding, and slope stability. The pile has been designed to withstand the erosive forces of a PMP through the construction of a two-foot-thick rock cover over the stabilized pile and contouring the pile with a maximum of four percent slopes on the top of the pile and 20 percent slopes on the sides of the pile.

Although the pile would not be near any major drainages, sheet flow resulting from a PMP event could damage the pile if it were not protected. In order to protect the pile against erosion during a PMP event, drainage ditches would be constructed to direct water away from the stabilized pile.

Protection against slope failure would be provided by constructing the stabilized pile partially below grade and by constructing the tailings embankment with gentle slopes as described above. The stabilized pile would not fail during a MCE.

Protection of the ground water would be provided by the construction of a low-permeability layer at the bottom of the tailings pile to inhibit the downward migration of contaminated water from the tailings. In addition, the radon barrier that would be placed over the tailings would inhibit infiltration of rainfall and runoff through the tailings pile.

<u>Construction estimates and schedule</u>

This alternative would require an estimated 34 months to complete. Employment would reach an estimated maximum of approximately 146 persons in the thirty-second month of the project and would average approximately 128 persons over the life of the project.

The project would consume an estimated 4.948 million gallons of fuel, 1.323 million kwh of electricity, and 72.548 million gallons of water.

This alternative would cost an estimated $56.30 million. The costs of property acquisition, engineering designs, overall project management, remedial action at vicinity properties, and long-term surveillance and maintenance are not included in these costs.

Appendix B, Engineering Designs, contains additional details on the construction estimates and costs for this alternative and Section 3.2.9 contains construction estimates and costs for remedial action at the vicinity properties.

Description of final condition

The stabilized tailings embankment would cover an area of approximately 62 acres and the entire disposal area would cover approximately 80 acres (Figure 3.3). The below-grade excavation of the disposal area would extend to an average depth of 14 feet. The tailings and contaminated material would be covered with an approximately five-foot-thick, compacted, earth cover. The stabilized tailings pile would have maximum sideslopes of 20 percent (5 horizontal to 1 vertical) and topslopes of four percent (Figure 3.4). The entire embankment would be covered with a two-foot-thick layer (including filter layers) of graded rock for erosion protection. The final stabilized pile would be a maximum of 35 feet above the surrounding terrain.

A rock erosion barrier would tie into an unpaved access road which would loop the toe of the stabilized tailings embankment. Drainage ditches adjacent to the pile and an interceptor ditch upstream of the pile would divert surface runoff around and away from the pile. Monuments would be established at set intervals designating the embankment as Federally-owned property.

After completion of the stabilized tailings pile at the disposal site and decontamination of the former mill site, the disturbed areas at each site (as required) would be restored with uncontaminated fill to a level compatible with the surrounding terrain, graded to promote drainage, and revegetated. The DOE would work with local officials to incorporate cost-effective measures into the reclamation of the 114-acre decontaminated Grand Junction site which are consistent with the long-term land use plan for the site as a recreation area. The 80 acres comprising the Cheney Reservoir site would be permanently restricted from any other uses.

All vicinity properties which meet DOE inclusion requirements would be cleaned up (Section 3.2.9).

3.2.5 Alternative 4: disposal at the Cheney Reservoir site with train and truck transport

Introduction

This alternative is the same as Alternative 3 except that the tailings and other contaminated material would be transported partially by train and partially by truck.

Under this alternative, the tailings and contaminated material would be loaded onto a train at the Grand Junction site and transported southeast to Whitewater, where the tailings would be

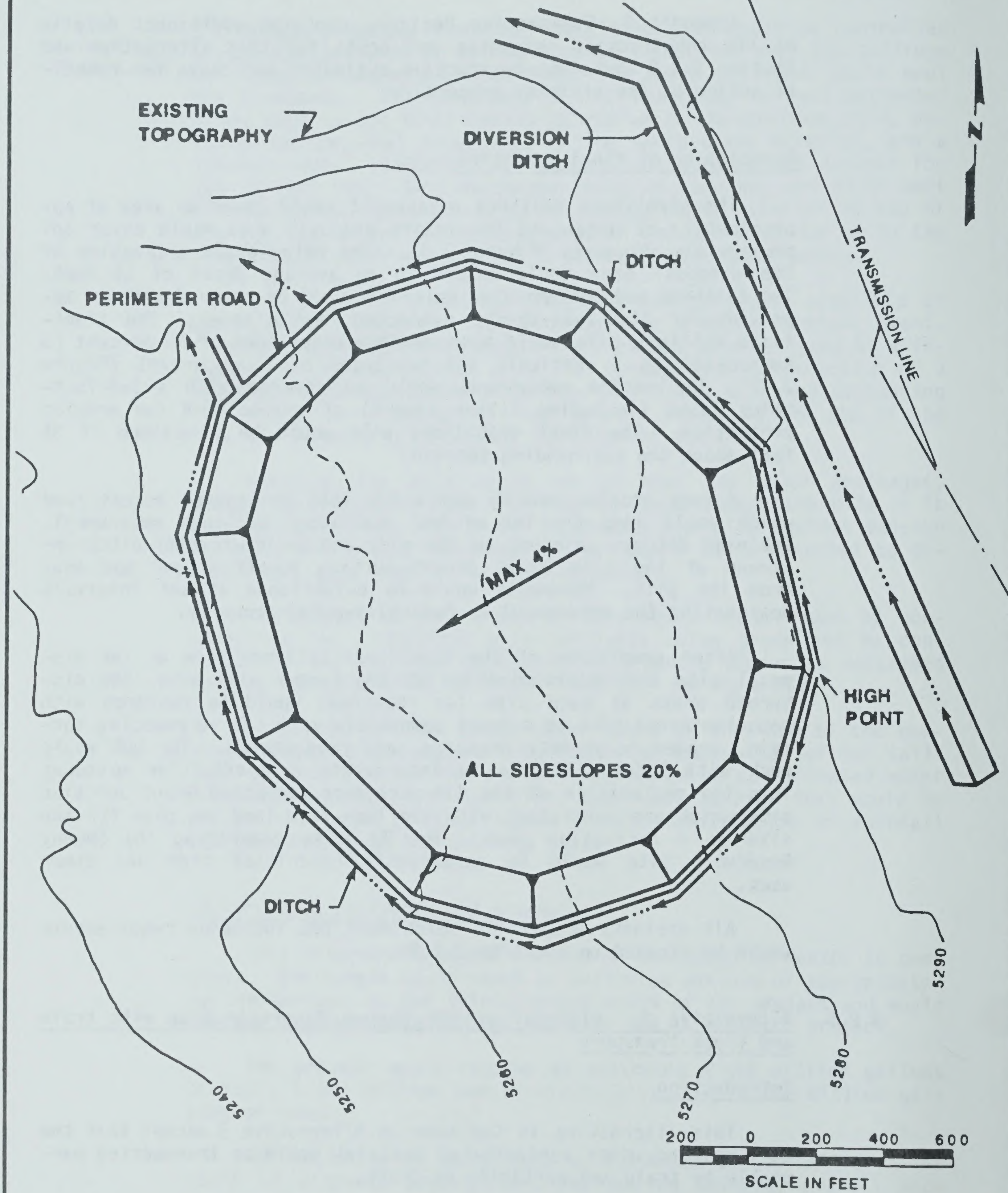


FIGURE 3.3
FINAL CONDITION–CHENEY RESERVOIR ALTERNATE DISPOSAL SITE

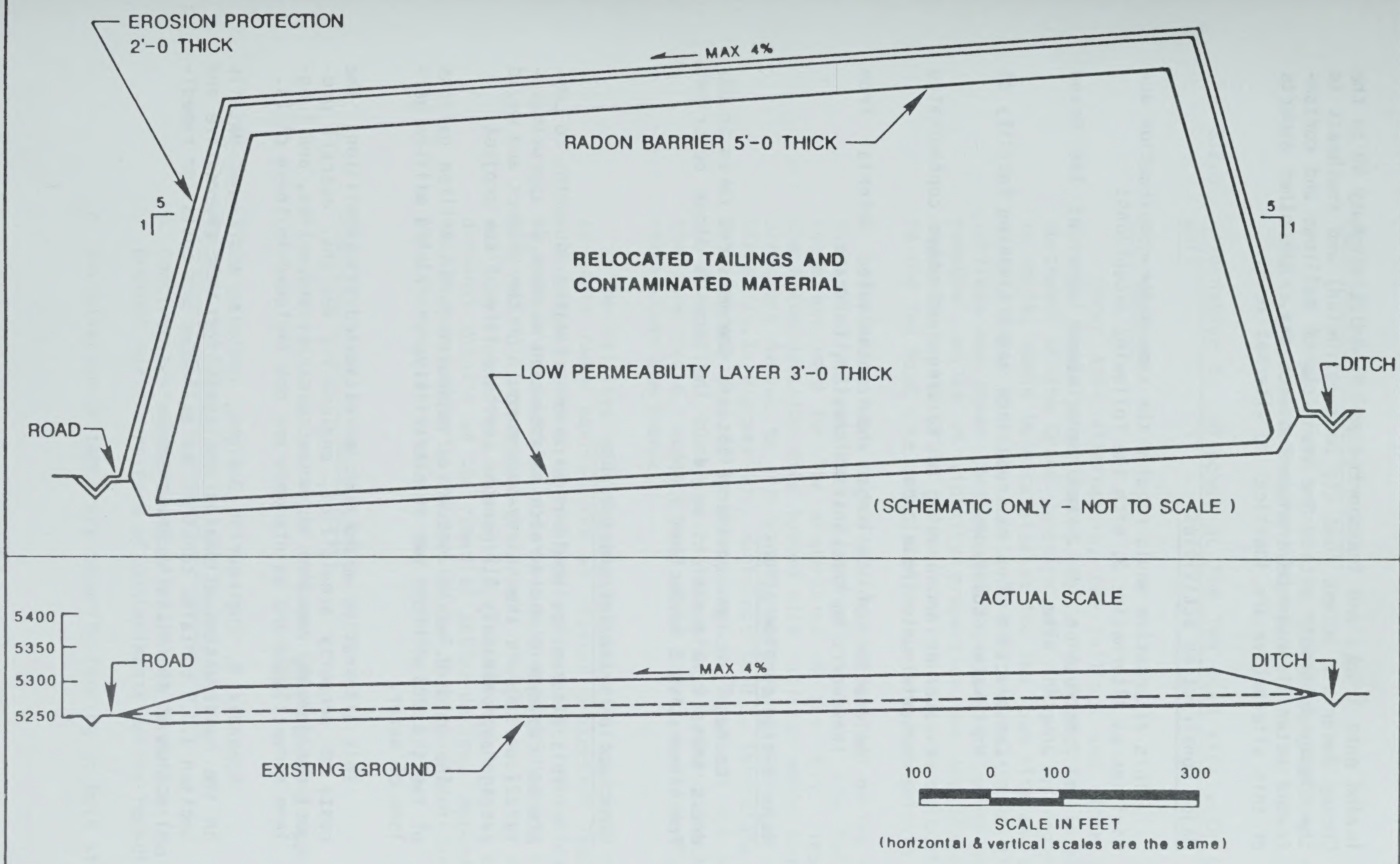


FIGURE 3.4

TYPICAL CROSS-SECTION - CHENEY RESERVOIR ALTERNATE DISPOSAL SITE loaded onto trucks and transported south on U.S. Highway 50 to the Cheney Reservoir access road (to be constructed) and southeast to the Cheney Reservoir site. One trainload of tailings and contaminated material would be transported each day. All other aspects of this alternative are identical to Alternative 3.

Major construction activities

This alternative would require the same major construction activities as Alternative 3, with the following exceptions:

- o Construction of a railroad loadout spur at the Grand Junction site.
- o Construction of a railroad spur and offloading facility at Whitewater, Colorado.
- o Excavation and loading of tailings and other contaminated material onto train cars.
- o Relocation of tailings and contaminated material from train cars to trucks at Whitewater, Colorado.

Major design considerations

The major design considerations and the measures taken to address these considerations would be the same as those described for Alternative 3 in Section 3.2.4.

Construction estimates and schedule

This alternative would require an estimated 34 months to complete. Employment would reach an estimated maximum of approximately 127 persons in the thirty-second month of the project and would average approximately 112 persons over the life of the project.

The project would consume an estimated 5.147 million gallons of fuel, 1.323 million kwh of electricity, and 73.105 million gallons of water.

This alternative would cost an estimated $93.17 million. The costs of property acquisition, engineering designs, overall project management, remedial action at vicinity properties, and long-term surveillance and maintenance are not included in these costs.

Appendix B, Engineering Designs, contains additional details on the construction estimates and costs for this alternative and Section 3.2.9 contains construction estimates and costs for remedial action at the vicinity properties.

Description of final condition

The final condition of the stabilized tailings would be the same as those described for Alternative 3 in Section 3.2.4.

3.2.6 Alternative 5: disposal at the Two Road site with truck transport

Introduction

Under this alternative, the tailings and other contaminated material would be relocated to the Two Road site, located 33 miles northwest of the Grand Junction site. A pit, averaging nine feet in depth, would be excavated at the Two Road site and a low-permeability layer would be constructed in the bottom of the pit. The tailings and other contaminated material (including material from remedial action at vicinity properties and the State Repository adjacent to the Grand Junction site) would be relocated by truck to the Two Road site and placed on the low-permeability layer.

The truck haul routes would be determined during the preparation of final engineering designs; however, the following haul route was used for the preparation of this EIS. Trucks leaving the Grand Junction site loaded with tailings would travel west on Struthers Avenue to 9th Street, north to Ute Avenue, west to 1st Street (U.S. Highway 50), northwest to U.S. Interstate 70, west to U.S. Highway 6 & 50 at Mack, west to Two Road, and north to the Two Road site. Trucks would return to the Grand Junction site by the same route, except they would travel east on Pitkin Avenue rather than Ute Avenue.

The tailings and contaminated material would be covered with an earth radon barrier and an erosion protection layer of small rock. After removal of the tailings and other contaminated material, the Grand Junction site would be recontoured and revegetated. All vicinity properties which meet the DOE inclusion requirements would be cleaned up. Appendix B, Engineering Designs, contains additional details on the remedial action design. Appendix L, Vicinity Property Report, and Section 3.2.9 contain additional information on remedial action at the vicinity properties.

Major construction activities

This alternative would require the following major construction activities.

At both the Grand Junction and Two Road sites

o Construction of waste-water retention basins at both sites to protect against release of contaminants during remedial action.

o Installation of temporary security fencing at both sites.

- Construction of drainage control measures to direct generated waste-water and storm-water runoff to the retention basins during construction activities.

<u>At the Grand Junction site</u>

- Installation of sheet-piling (if necessary) along the south and portions of the southwest and southeast perimeters of the existing pile to retard surface flows from the Colorado River and ground-water intrusion during excavation.
- Implementation of measures to control erosion and sedimentation from disturbed areas during construction.
- Installation and operation of a waste-water treatment facility (if necessary) at the Grand Junction processing site to treat contaminated water prior to discharge into the Colorado River.
- Protection (or relocation) of surface or subsurface utilities at the Grand Junction site during construction.
- Construction of a truck wash station.
- Upgrading and construction of the haul route, U.S. Highway 6 & 50, where required.
- Excavation and loading of tailings and other contaminated material onto trucks.
- Restoration of excavated areas at the Grand Junction site.
- Revegetation of disturbed areas at the Grand Junction site.

<u>At the Two Road site</u>

- Construction of an access road from Two Road to the Two Road site (approximately 0.5 mile).
- Upgrading selected portions of the haul route to reduce traffic impacts.
- Construction of a truck wash station.
- Excavation of materials at the Two Road site and preparation of the low-permeability soil layer.
- Relocation of the tailings and other contaminated material to the Two Road site.
- Construction of the tailings embankment.
- Construction of the final cover system over the tailings to inhibit water infiltration, radon exhalation, and wind and water erosion.

- o Revegetation of disturbed areas not included in the stabilized pile at the Two Road site.

At the Fruita borrow site (see Section 3.2.8, Borrow sites)

- o Excavation of erosion protection material and loading onto trucks.
- o Relocation of borrow material to the Two Road site.

Major design considerations

The major design considerations include providing for the control of radon emissions, long-term stability, and ground-water protection. These considerations are discussed below and additional details are contained in Appendix B, Engineering Designs, Appendix F, Hydrology Report, and Appendix I, Radiation Health Effects.

Radon emissions from the stabilized pile would be controlled by the construction of a compacted earth barrier over the tailings and other contaminated materials. The radon emissions would meet EPA standards. The thickness of the earth barrier was determined using data on the distribution of radium in the tailings pile, data on the physical properties of the earth cover material, and a computer model (RAECOM). A five-foot-thick cover was assumed for use in the EIS. This thickness could be reduced, and still meet EPA standards, by placing lesser contaminated material on top of the tailings prior to the placement of the radon barrier or by the selection of other material as a source of the radon cover.

The principal features affecting the long-term stability of the stabilized pile include erosion from a major rainfall event, flooding, and slope stability. The pile has been designed to withstand the erosive forces of a PMP through the construction of a two-foot-thick rock cover over the stabilized pile and contouring the pile with a maximum of four percent slopes on the top of the pile and 20 percent slopes on the sides of the pile.

Although the pile would not be near any major drainages, sheet flow resulting from a PMP event could damage the pile if it were not protected. In order to protect the pile against erosion during a PMP event, drainage ditches would be constructed to direct water away from the stabilized pile.

Protection against slope failure would be provided by constructing the stabilized pile partially below grade and by constructing the tailings embankment with gentle slopes as described above. The stabilized pile would not fail during an MCE event.

Protection of the ground water would be provided by the construction of a low-permeability layer as the bottom of the tailings pile to inhibit the downward migration of contaminated water from the tailings. In addition, the radon barrier that would be placed over the tailings would inhibit infiltration of rainfall and runoff through the tailings pile.

Construction estimates and schedule

This alternative would require an estimated 34 months to complete. Employment would reach an estimated maximum of approximately 147 persons in the thirty-second month of the project and would average approximately 127 persons over the life of the project.

The project would consume an estimated 5.108 million gallons of fuel, 1.365 million kwh of electricity, and 69.174 million gallons of water.

This alternative would cost an estimated $77.48 million. The costs of property acquisition, engineering designs, overall project management, remedial action at vicinity properties, and long-term surveillance and maintenance are not included in these costs.

Appendix B, Engineering Designs, contains additional details on the construction estimates and costs for this alternative and Section 3.2.9 contains construction estimates and costs for remedial action at the vicinity properties.

Description of final condition

The stabilized tailings embankment would cover an area of approximately 62 acres and the entire disposal area would cover approximately 80 acres (Figure 3.5).

The below-grade excavation of the disposal area would extend to an average depth of nine feet. The tailings and contaminated material would be covered with an approximately five-foot-thick, compacted, earth cover. The stabilized tailings pile would have maximum sideslopes of 20 percent (5 horizontal to 1 vertical) and topslopes of four percent (Figure 3.6). The entire embankment would be covered with a two-foot-thick layer (including filter layer) of graded rock for erosion protection. The final stabilized pile would be a maximum of approximately 35 feet above the surrounding terrain.

A rock erosion barrier would tie into an unpaved access road which would loop the toe of the stabilized tailings embankment. Drainage ditches adjacent to the pile would divert surface runoff around and away from the pile. Monuments would be established at set intervals designating the embankment as Federally-owned property.

After completion of the stabilized tailings pile at the disposal site and decontamination of the former mill site, the disturbed areas at each site (as required) would be restored with uncontaminated fill to a level compatible with the surrounding terrain, graded to promote drainage, and revegetated. The DOE would work with local officials to incorporate cost-effective measures into the reclamation of the 114-acre decontaminated Grand Junction site which are consistent with the long-term land use plans for the site as a recreation area. The 80 acres comprising the Two Road site would be permanently restricted from any other uses.

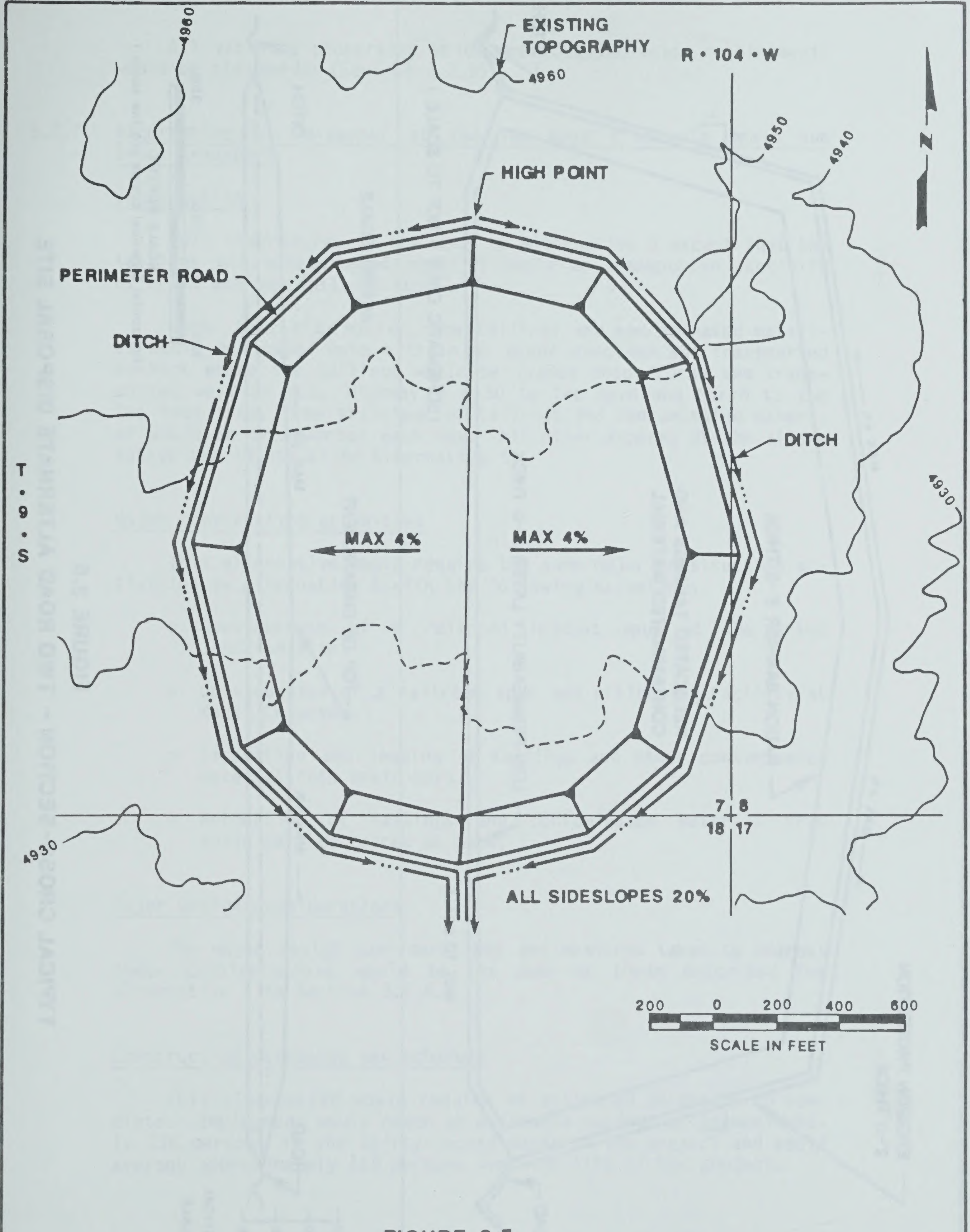


FIGURE 3.5
FINAL CONDITION-TWO ROAD ALTERNATE DISPOSAL SITE

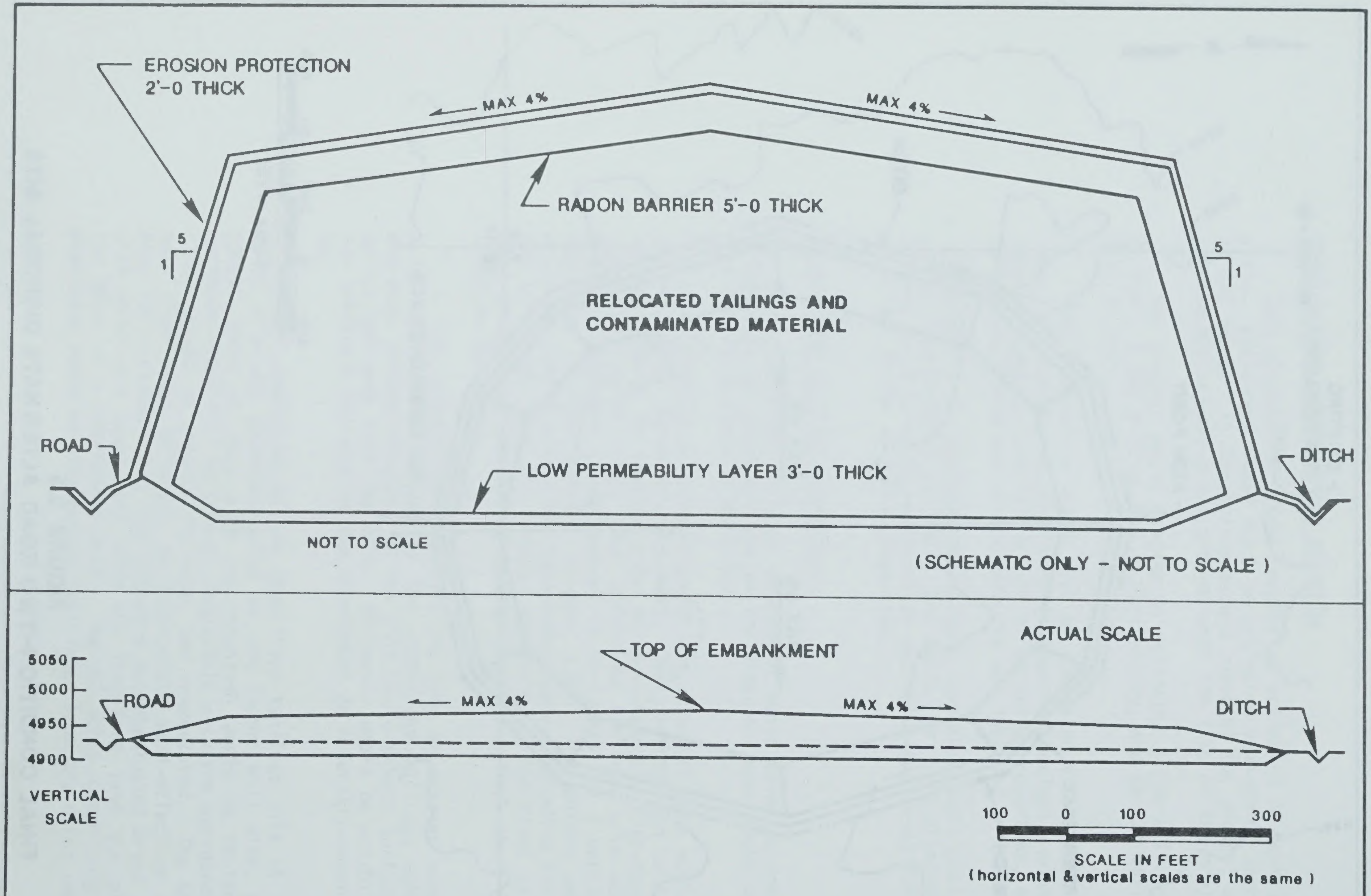


FIGURE 3.6

TYPICAL CROSS-SECTION - TWO ROAD ALTERNATE DISPOSAL SITE

All vicinity properties which meet DOE inclusion requirements would be cleaned up (Section 3.2.9).

3.2.7 Alternative 6: disposal at the Two Road site with train and truck transport

Introduction

This alternative is the same as Alternative 5 except that the tailings and contaminated material would be transported partially by train and partially by truck.

Under this alternative, the tailings and contaminated material would be loaded onto a train at Grand Junction and transported to Mack where the tailings would be loaded onto trucks and transported west on U.S. Highway 6 & 50 to Two Road and north to the Two Road site. One trainload of tailings and contaminated material would be transported each day. All other aspects of the alternative are identical to Alternative 5.

Major construction activities

This alternative would require the same major construction activities as Alternative 5 with the following exceptions:

- o Construction of a railroad loadout spur at the Grand Junction site.
- o Construction of a railroad spur and offloading facility at Mack, Colorado.
- o Excavation and loading of tailings and other contaminated material into train cars.
- o Relocation of tailings and contaminated material from train cars to trucks at Mack.

Major design considerations

The major design considerations and measures taken to address these considerations would be the same as those described for Alternative 5 in Section 3.2.6.

Construction estimates and schedule

This alternative would require an estimated 34 months to complete. Employment would reach an estimated maximum of approximately 136 persons in the thirty-second month of the project and would average approximately 118 persons over the life of the project.

The project would consume an estimated 6.818 million gallons of fuel, 1.365 million kwh of electricity, and 69.834 million gallons of water.

This alternative would cost an estimated $106.69 million. The costs of property acquisition, engineering designs, overall project management, remedial action at vicinity properties, and long-term surveillance and maintenance are not included in these costs.

Appendix B, Engineering Designs, contains additional details on the construction estimates and costs for this alternative and Section 3.2.9 contains construction estimates and costs for remedial action at the vicinity properties.

Description of final condition

The final condition of the stabilized tailings would be the same as those described for Alternative 5 in Section 3.2.6.

3.2.8 Borrow sites

Three potential borrow sites have been identified for remedial action (Figure 3.7). These borrow sites would be used to obtain any earth material needed to complete remedial action which is not available at the disposal site.

Borrow site 32 and C½ is a series of active borrow pits approximately six miles east of the Grand Junction site. Fine, medium, and coarse-grained material are available at these pits; however, large boulders are not available in large quantities.

The Fruita borrow site is an active borrow pit located on the south side of the community of Fruita approximately 15 miles east of the Two Road site. Fine, medium, and coarse-grained material are available at the site; however, large boulders are not available in large quantities.

The Unaweep Canyon borrow site is located adjacent to Route 141 in Unaweep Canyon, approximately 25 miles southwest of Whitewater. The exact location of this borrow site would be selected in consultation with the U.S. Bureau of Land Management (BLM). Large boulders may be quarried from the site.

Borrow material for Alternative 2, stabilization at the Grand Junction site, for the radon cover, erosion cover, fill material, capillary break, and low-permeability layer would be obtained from the 32 and C½ borrow site. Material for the rock armoring would be obtained from the Unaweep Canyon borrow site.

All borrow material for Alternatives 3 and 4, disposal at the Cheney Reservoir site by truck or train and truck transport, would be obtained from the Cheney Reservoir site. No borrow sites would be needed.

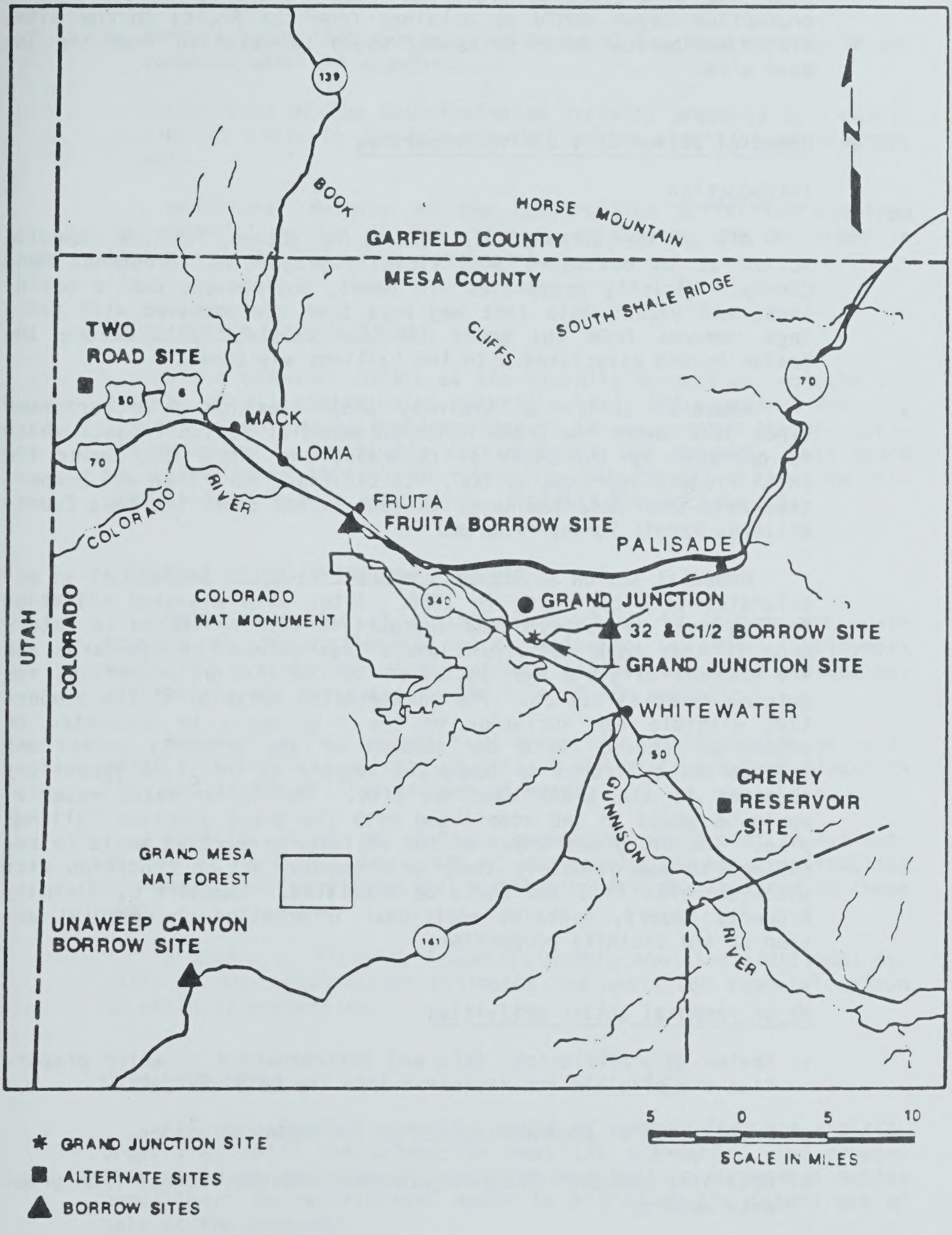


FIGURE 3.7
LOCATION OF BORROW SITES

Borrow material for Alternatives 5 and 6, disposal at the Two Road site with truck or train and truck transport, for the erosion protection layer would be obtained from the Fruita borrow site. All other borrow material needed would be obtained from the Two Road site.

3.2.9 Remedial action at vicinity properties

Introduction

All of the alternatives, except no action, include remedial action at an estimated 3465 vicinity properties throughout Mesa County. Vicinity properties are homes, businesses, public buildings, and vacant lots that may have been contaminated with tailings removed from the Grand Junction tailings pile before the health hazard associated with the tailings was known.

Remedial action at vicinity properties has been performed since 1972 under the Grand Junction Remedial Action Project which is operated by the State of Colorado, and since 1982 under the UMTRA Project operated by DOE. In addition, more than 800 properties have been decontaminated to some extent under the Mesa County Building Permit Survey Program.

Remedial action at vicinity properties would proceed at an accelerated pace beginning in 1986. Sites with elevated radiation levels would be surveyed and appropriate data collected to determine if they have radiation levels that exceed EPA standards and are thereby eligible for inclusion on the list of properties requiring remedial action. The contaminated material at the properties eligible for inclusion on the list would be excavated or otherwise removed (with the consent of the property owner) and transported by trucks to temporary storage at the State Repository adjacent to the Grand Junction site. The contaminated material would be added to and stabilized with the Grand Junction tailings pile. The disturbed areas at the vicinity properties would be reclaimed to approximately their pre-remedial action condition with uncontaminated fill and would be vegetated. Appendix L, Vicinity Property Report, contains additional information on remedial action at the vicinity properties.

Major remedial action activities

- Review of radiological data and determination of which properties are eligible for inclusion into the UMTRA Project.
- Preparation of engineering design for remedial action.
- Obtaining Remedial Action Agreements (consent forms) from property owners.
- Removal of contaminated material from the vicinity property. This activity may include removal of fill material, contaminated structural members (cinder blocks, cement, wood frames), and associated materials.

- o Relocation of residents or businesses during remedial action if necessary.
- o Certification that contaminated material has been removed in accordance with EPA standards.
- o Restoration of the decontaminated vicinity property to a condition as close to its pre-remedial action condition as practicable.

Additional details on the construction activities required for remedial action at the vicinity properties are contained in Appendix L, Vicinity Property Report.

Major design considerations

Since remedial action at the vicinity properties includes the removal of all contaminated materials until EPA standards are met, the only major design consideration is to ensure that the appropriate material is thoroughly characterized and removed. This would be accomplished through an extensive radiological monitoring program as described in Appendix L, Vicinity Property Report.

Construction estimates and schedule

Remedial action at vicinity properties is ongoing but would proceed at an accelerated pace beginning in 1986. Employment would reach a maximum of 815 persons in 1987 and would average approximately 495 persons over the life of the project.

Remedial action at vicinity properties would consume an estimated 1.740 million gallons of fuel, 0.007 million kwh of electricity, and 11.986 million gallons of water.

Remedial action at vicinity properties would cost an estimated $99.36 million. The costs of engineering design, construction management, and environmental monitoring are not included in these costs.

Appendix L, Vicinity Property Report, contains additional details on the construction estimates and costs for remedial action at vicinity properties.

Final condition

All contaminated materials would be removed from the vicinity properties until the properties meet EPA standards. The properties would be reclaimed to approximately their pre-remedial action condition. No restrictions would be placed on the future use or sale of the property.

The contaminated material would be disposed of by adding it to and stabilizing it with the Grand Junction tailings, regardless of which alternative is selected (except no action). The contaminated materials at the State Repository adjacent to the Grand Junction site would be removed until EPA standards are met. Any portion of the State Repository which is not used for final disposal of the Grand Junction tailings would be released for any uses consistent with local land use plans.

3.2.10 Potential co-disposal with DOE GJAO Wastes

All of the alternatives, except no action, include the cummulative potential impacts from co-disposal of the tailings and wastes which now reside at the DOE GJAO. The GJAO waste would be loaded onto trucks, and transported along the routes described in Sections 3.2.4 and 3.2.6, or directly to the Grand Junction former mill site (Alternative 2). At the final disposal site, these additional materials would be disposed of by adding them to and stabilizing them with the Grand Junction tailings, regardless of which action alternative is selected. The formerly contaminated areas of the GJAO would be reclaimed and released for use consistent with DOE needs. The DOE is preparing a separate environmental assessment for this remedial action.

3.3 ALTERNATIVES ELIMINATED FROM DETAILED STUDY

Alternatives which are not addressed in the EIS include disposal at other alternate disposal sites, codisposal of the Grand Junction and Rifle tailings at one disposal site, reprocessing the tailings prior to disposal, and returning the tailings to the mines from which the uranium ore was mined. The reasons for eliminating these alternatives are described below. Additional details are contained in Appendix C, Alternatives Eliminated from Detailed Study.

3.3.1 Stabilization at other state-nominated locations

The process by which the alternate disposal sites were selected involved the public, city and county officials, the State of Colorado, and DOE. Colorado searched the Grand Junction area for potential disposal sites in 1981 and identified 30 areas which appeared to have conditions suitable for tailings disposal. These 30 areas were evaluated against exclusionary criteria which resulted in the selection of nine potential disposal sites. These nine sites were then arithmetically rated with a technical grading matrix. Public hearings were held to solicit public participation in the alternate disposal site nomination process. A Candidate Site Review Committee, consisting of city, county, and state officials, met in public session and nominated four sites for further analysis and consideration by the DOE. These four sites were East Salt Creek, 6 & 50 Reservoir, Cheney Reservoir, and Lucas Mesa. The Lucas Mesa site was included as a potential site only for the colocation of both the Grand Junction tailings and the tailings located at Rifle, Colorado.

During early preparation of the DEIS, DOE evaluated the four sites nominated by Colorado in 1982 against technical suitability criteria consisting of five categories: environmental, geologic, hydrologic, land ownership and land use restrictions, and engineering economics. Through this process the DOE, with the concurrence of the State of Colorado, selected the 6 & 50 Reservoir, Cheney Reservoir, and Lucas Mesa as potential alternate sites. Lucas Mesa was to be included only if the Grand Junction and Rifle tailings sites were to be colocated. The Salt Creek site was eliminated from further consideration because it was nearly identical to the 6 & 50 site.

Following the collection of environmental data and preliminary engineering, the DOE, with the concurrence of the State of Colorado, eliminated from further consideration the alternative of relocating the Grand Junction and Rifle tailings at Lucas Mesa because the environmental impacts and costs of this alternative were unacceptably high. In addition, the DOE, with the concurrence of Colorado, replaced the 6 & 50 site with the Two Road site because the two sites are nearly identical; however, the Two Road site is less susceptible to erosion and is therefore a better site for tailings disposal.

Therefore, the Cheney Reservoir and Two Road alternate disposal sites are addressed in this EIS along with stabilizing the tailings at the existing site in Grand Junction.

Since railroad lines run between Grand Junction and the general vicinity of both the Cheney Reservoir and Two Road sites, both rail transportation and truck transportation of the tailings to the alternate sites are addressed as separate alternatives in this EIS.

In the fall of 1985, DOE conducted a further site screening process to identify an alternate site in the Grand Junction area that was both technically suitable and less costly than the other alternatives. Sites within a 10-mile radius of the center of Grand Junction were evaluated and the optimum site was determined to be a site one mile southeast of Grand Junction. Following the preparation of an initial cost analysis and discussions with local officials, DOE determined, and the State of Colorado concurred, that relocation of the tailings to a site only one mile from Grand Junction was not appropriate. This alternative was therefore eliminated from further consideration.

3.3.2 Other alternatives

Reprocessing the tailings prior to stabilization was rejected because the costs of reprocessing greatly exceeded the value of the resources produced. In addition, reprocessing the tailings would not reduce the radium content of the tailings. Since the radioactive decay of radium is the source of radon (the principal health hazard from the tailings), there would be no reduction of the hazard from radon daughters. Therefore, the reprocessed tailings would still require remedial action to meet EPA standards. Reprocessing the tailings was therefore rejected as unreasonable.

The uranium ore processed at the Grand Junction site was mined from a large number of surface and underground mines in the western Colorado and eastern Utah areas. These mines have been abandoned for many years and many have collapsed. The possibility of returning the Grand Junction tailings to these mines was considered but was rejected as infeasible and unreasonable because many of the mines are inaccessible and the environmental conditions (such as the presence of ground water) are not conducive to tailings disposal.

3.4 ENVIRONMENTAL IMPACTS

This section summarizes the major environmental impacts of the remedial action alternatives. A tabular comparison of all impacts is presented in Table 1.1, and Section 5.0 provides a detailed discussion of these impacts.

3.4.1 Comparison of impacts

The primary impacts of the alternatives relate to radiation doses, land use, transportation, noise, air quality, employment, population, and costs.

Under the no action alternative, the radiation doses and projected health impacts from the tailings pile and the vicinity properties would continue to increase above present unacceptable levels (400 cancer deaths in 1000 years from the radiation released from the tailings piles and 1000 cancer deaths in 1000 years from the radiation released from the vicinity properties assuming a constant population). Under each of the other alternatives, the radiation releases from the tailings pile and the vicinity properties would be reduced to EPA standards and would thereby significantly reduce the potential health impacts. However, there would continue to be small releases of radiation from the stabilized piles and since the stabilization at the Grand Junction site would involve leaving the stabilized tailings near the population of Grand Junction, this alternative would result in higher projected health impacts (20 cancer deaths in 1000 years) than disposal at the more remote Cheney Reservoir site (two cancer deaths in 1000 years) or disposal at the Two Road site (two cancer deaths in 1000 years). These projected health impacts are based on a constant population and an increase in the population of Mesa County would cause the health impacts for no action and stabilization at the Grand Junction site to increase more than the other alternatives.

Under no action and stabilization at the Grand Junction site, 114 acres and 93 acres, respectively, of land adjacent to the city of Grand Junction would be unavailable for productive land uses such as industrial or recreational development. The site has considerable potential for both of these land uses. Under the other alternatives, the Grand Junction site would be decontaminated and released for other uses while 80 acres of land used for low density grazing would be restricted for use for tailings disposal.

Under the no action alternative, there would be no transportation impacts. Stabilization at the Grand Junction site would cause a large increase in traffic (primarily trucks) on city streets around the Grand Junction site and on D Road and State Highway 146.

This increase in traffic would cause an estimated 0.09 traffic fatalities, a small amount of traffic congestion on city streets around the Grand Junction site during rush hours (7:30 a.m. to 9:30 a.m. and 4:30 p.m. to 5:30 p.m.), and increased road maintenance on D Road and State Highway 146. The Cheney Reservoir and Two Road truck transport alternatives would cause much greater traffic fatalities (0.26 and 0.38, respectively), slightly greater traffic congestion, and greater road maintenance than stabilization at the Grand Junction site. Disposal at the Cheney Reservoir site with truck transport would require some upgrading and maintenance of the haul route (U.S. Highway 50, D Road, and State Highway 146). Disposal at the Two Road site with truck transport would require major upgrading of U.S. Highway 6 & 50 between Mack on Two Road and would cause some congestion on 9th Street. The Cheney Reservoir and Two Road train and truck transport alternatives would have much lesser traffic impacts than the truck transport alternative; however, since the last leg of the transport would be by truck, there would still be some traffic impacts. The traffic fatalities would be 0.14 and 0.17, respectively. Disposal at the Cheney Reservoir site with train and truck transport may require some upgrading and maintenance of U.S. Highway 50 between Whitewater and the Cheney Reservoir site. Disposal at the Two Road site with train and truck transport would require major upgrading and maintenance of U.S. Highway 6 & 50 between Mack and Two Road.

Under all of the action alternatives, there would be daytime noise from construction equipment which would disturb residents near the Grand Junction site, along the transportation routes and the vicinity properties. In addition, the Cheney Reservoir with train and truck transport and the Two Road with train and truck transport alternatives would cause noise that would disturb residents at Whitewater and Mack, respectively.

Under all of the alternatives, except no action, Federal and state 24-hour air quality standards for the concentrations of particulates (dust) would be exceeded at the Grand Junction site and at the alternate disposal sites. Annual Federal and state standards may also be exceeded. The maximum 24-hour concentration of particulates would range from 425 micrograms per cubic meter for disposal at the Cheney Reservoir site with truck transport to 331 micrograms per cubic meter for disposal at the Two Road site with truck transport. The Federal and state 24-hour primary standard is 260 micrograms per cubic meter. Particulate releases from vicinity property remedial action would be small.

All of the alternatives, except no action, would cause about the same increases in employment. The number of persons directly employed during maximum site activities would range from 127 persons for disposal at Cheney Reservoir with truck transport to 185 persons for stabilization at the Grand Junction site. In addition, the number of persons directly employed during maximum activities at the vicinity properties would be 815 persons. Therefore, the total project-related direct employment would range from 942 to 1000 persons. The total project-related direct, indirect, and induced employment during peak activities would range from 1727 to 1792 persons. Approximately 75 percent of the jobs created would be filled by persons already living in Mesa County.

All of the alternatives, except no action, would cause about the same increases in the population of Mesa County and Grand Junction. The increases in the population of Grand Junction during maximum site activities would range from 295 persons for stabilization at the Grand Junction site to 362 for disposal at the Two Road site with truck and train transport. In addition, the population increase in Grand Junction from remedial action at vicinity properties would be 600 persons. Therefore, the total project related population increases for Grand Junction would range from 895 to 962 persons. Social services in Grand Junction (schools, medical facilities, sewage treatment facilities, and the like) are adequate to handle these increases.

The estimated costs of the alternatives, in order of increasing costs, are shown below:

Alternative	Cost in millions (1985 dollars)
No action	0.0
Cheney Reservoir truck	56.30
Grand Junction	65.38
Two Road truck	77.48
Cheney Reservoir train and truck	93.17
Two Road train and truck	106.69

Remedial action at the vicinity properties would add an additional $99.36 million to the costs of all alternatives, except no action. These estimates do not include the costs of property acquisition, engineering designs, overall project management, or long-term surveillance and maintenance. The major costs involved with stabilization at the Grand Junction site result from the need to construct a base for the tailings that is above the groundwater level and from the need to place riprap around the entire pile to protect it against erosion from a PMF. The major costs for the Cheney Reservoir with truck transport and the Two Road with truck transport alternatives result from the relatively long haul distances; 18 miles for Cheney Reservoir truck and 33 miles for Two Road truck alternatives. The major costs for the Cheney Reservoir with train and truck transport and the Two Road with train and truck transport alternatives result from the construction of rail spurs and loadout facilities as well as the need to transfer the tailings to trucks for the last leg of the haul route.

3.4.2 Mitigative measures

Mitigative measures to reduce the environmental impacts of the project have been incorporated into each of the remedial action alternatives, except for the no action alternative. These mitigative measures are presented in greater detail in Section 5.20.

Several mitigative measures have been considered but rejected. The construction of a rail spur from the main rail line to either the Cheney Reservoir or Two Road site was considered. This would eliminate the need to transfer the tailings to trucks at either Whitewater or Mack but was rejected because of excessive costs.

The construction of a conveyor to transport the tailings across the Colorado River for the Cheney Reservoir with truck transport alternative was considered. The conveyor would reduce the traffic congestion around the Grand Junction site but was rejected because of the potential for spills in the Colorado River and because of excessive costs.

Conducting remedial action over a longer time period was considered in order to reduce traffic congestion, air quality impacts, noise, and population increases. This measure was rejected because the U.S. Congress has mandated that all remedial action be completed by March, 1990.

3.4.3 Summary of major impacts

The no action alternative would leave unchanged the existing unacceptable level of radiation exposure to people in and around Grand Junction from both the tailings pile and 3465 vicinity properties. The tailings would continue to be subject to wind and water erosion which would result in a continuously expanding area unsafe for human use. In addition, the 114 acres which comprise the tailings site and the State Repository would be unavailable for productive land uses. This alternative would not be consistent with the intent of Congress in UMTRCA (PL95-604) and would not result in compliance with the EPA standards (40 CFR Part 192).

Stabilization at the Grand Junction site would cause Federal and state air quality standards to be exceeded, annoyance to residents near the Grand Junction site from noise during the daytime, and prevent the use of 93 acres at the Grand Junction site for other productive land uses.

Disposal at the Cheney Reservoir site with truck transport would cause Federal and state air quality standards to be exceeded, annoyance to residents near the Grand Junction site from noise during the daytime, and a large increase in traffic with the associated increase in congestion, accidents, and road maintenance, on city streets around the Grand Junction site and on the haul routes to and from the disposal site.

Disposal at the Cheney Reservoir site with train and truck transport would cause the same impacts as disposal at Cheney Reservoir with truck transport except that there would be a much smaller impact on traffic congestion, accidents, and road maintenance.

Disposal at the Two Road site with truck transport or train and truck transport would have similar impacts to disposal at Cheney Reservoir with truck or train and truck transport, respectively.

The direct monetary costs of the alternatives, in order of increasing costs are: no action ($0.0), disposal at the Cheney Reservoir with truck transport ($56.30 million), stabilization at the Grand Junction site ($65.38 million), disposal at the Two Road site with truck transport ($77.48 million), disposal at the Cheney Reservoir site with train and truck transport ($93.17 million), and disposal at the Two Road site with train and truck transport ($106.69 million).

All of the alternatives, except no action, include remedial action at the vicinity properties. The primary impacts include annoyance to nearby residents from noise, possible temporary relocation of some residents, possible temporary closing of some businesses, and direct monetary costs of $99.36 million.

All of the alternatives, except no action, include the cummulative potential impacts from co-disposal of the GJAO wastes with those of the Grand Junction former mill site. The primary impacts are those short-term impacts from remedial action such as marginally additional noise, traffic congestion, accidents, and road maintenance. The DOE is preparing a separate environmental assessment for this remedial action.

REFERENCES FOR SECTION 3.0

DOE (U.S. Department of Energy), 1986. Environmental Assessment of Remedial Action at the Vicinity Properties Associated with the Former Climax Uranium Company Uranium Mill Site, Grand Junction, Mesa County, Colorado, DOE/EA-0311, prepared by the U.S. Department of Energy, UMTRA Project Office, Albuquerque Operations Office, Albuquerque, New Mexico.

4.0 AFFECTED ENVIRONMENT

This chapter describes the environmental conditions of the region (Section 4.1), the sites that may be affected (Section 4.2), and the pertinent characteristics of each site. This chapter emphasizes those features that may affect the region's suitability for tailings disposal and those features that would be affected by the remedial action.

4.1 REGIONAL SETTING

The Grand Junction site and the two alternate disposal sites are in Mesa County, in western Colorado (Figure 4.1). The Grand Junction site is adjacent to the Colorado River and the city of Grand Junction, which is the largest city in western Colorado and the county seat.

The Cheney Reservoir site is 18 miles southeast of Grand Junction on relatively remote Federal land administered by the U.S. Bureau of Land Management (BLM). The site is just west of Grand Mesa in the Gunnison River Valley.

The Two Road site is 33 road miles northwest of Grand Junction on remote Federal land administered by the BLM. The site is in Grand Valley, two miles east of the Utah-Colorado state border.

This area of Colorado is semiarid, with only about eight inches of precipitation per year, which includes about 27 inches of snow. Temperatures above 100°F or below 0°F are rare, and sunny days usually predominate in all seasons. Winds are most frequently from the southeast, with an average speed of approximately eight miles per hour.

The region has well-developed railroad and highway systems. The railroad system includes a spur into the Grand Junction site and lines near the alternate sites. Interstate 70 and U.S. Highway 6 & 50 are the major highways connecting Grand Junction with the Two Road site. U.S. Highway 50 connects Grand Junction with the Cheney Reservoir site.

4.2 DESCRIPTION OF THE AFFECTED SITES

4.2.1 Grand Junction site

The Grand Junction site is adjacent to the city of Grand Junction and the Colorado River, and south of the tracks of the Denver and Rio Grande Western Railroad. The site and its vicinity are shown in Figure 4.2.

The uranium ore processed by the uranium mill at the Grand Junction site averaged 0.28 percent uranium and 1.41 percent vanadium. The ore was crushed, ground, and treated in a variety of ways to extract uranium and vanadium. The mill processed 2.3 million tons of ore. The uranium and vanadium produced through 1966 were purchased by the U.S. Atomic Energy Commission. The uranium and vanadium produced after 1966 were sold commercially.

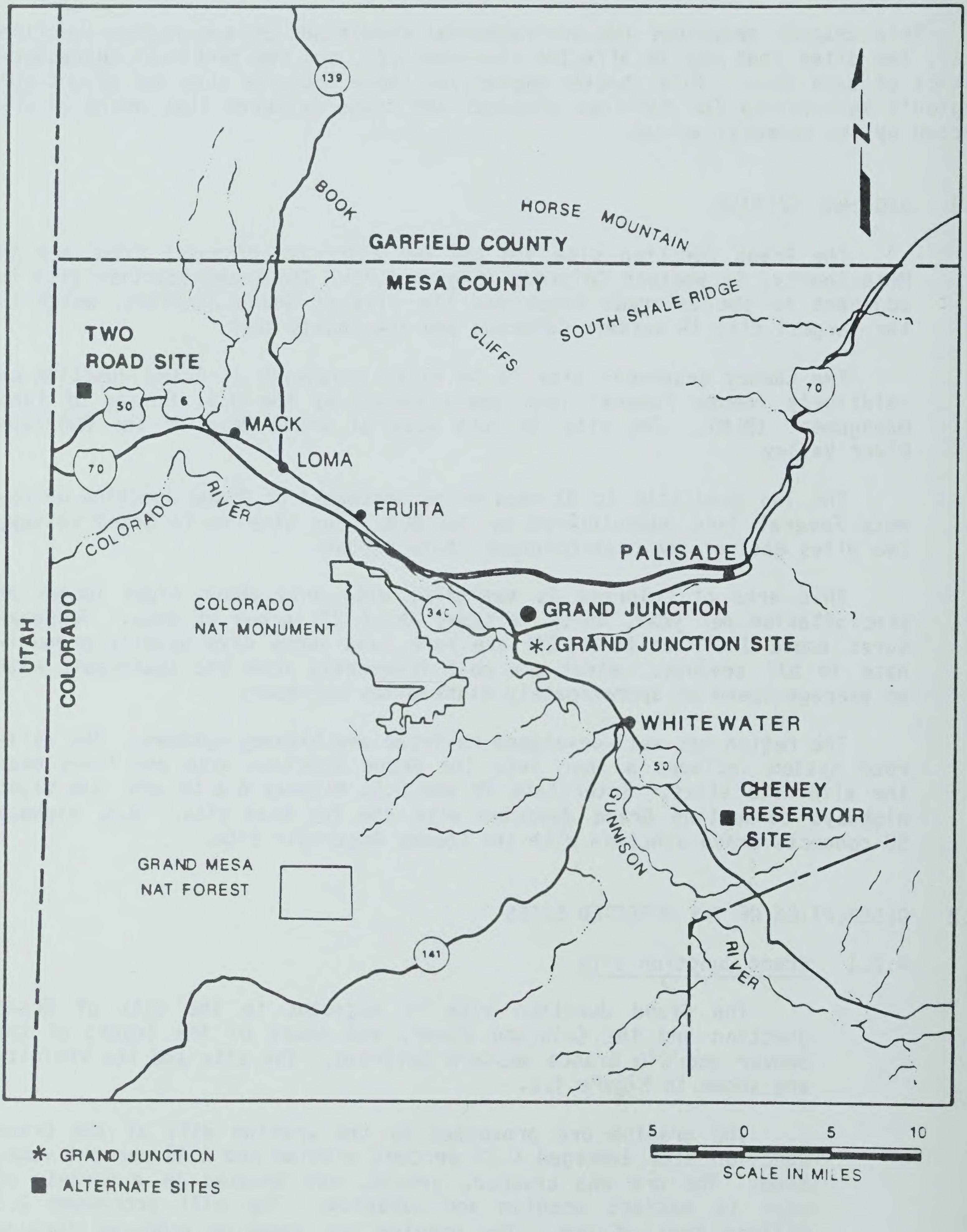


FIGURE 4.1
GRAND JUNCTION REGIONAL MAP

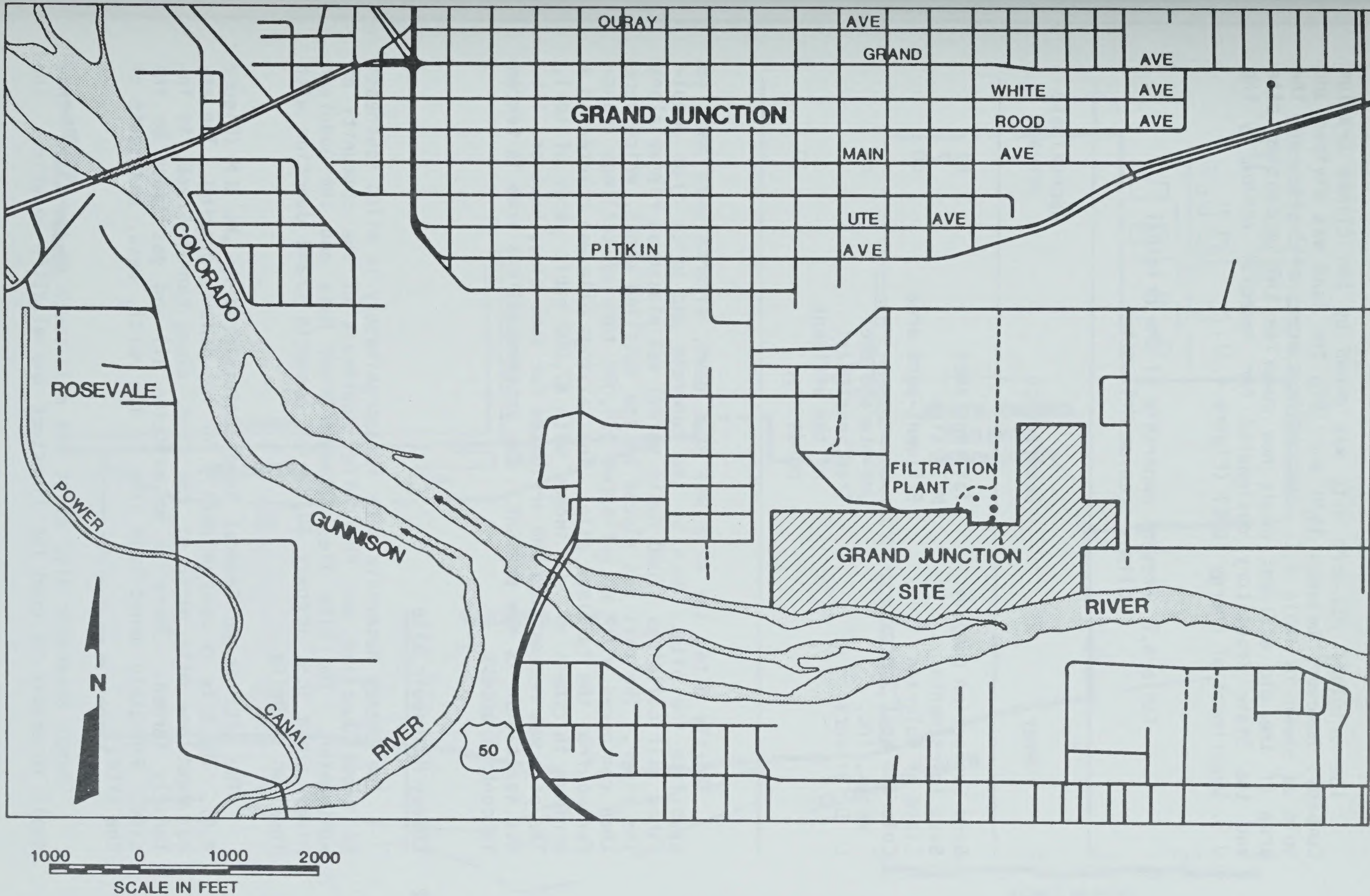


FIGURE 4.2
THE GRAND JUNCTION SITE AND ITS VICINITY

The original 203-acre site was owned by the Climax Uranium Company; however, between 1970 and 1976 the land was divided and sold as shown in Table 4.1. The tailings area, mill site, and the area of the old effluent ponds now comprise the processing site and the State Repository designated for remedial action by the U.S. Department of Energy (DOE) (Figure 4.3).

Table 4.1 Present ownership of the original Climax Uranium Mill site

Owner	Description	Approximate acreage
Sand Extraction Company	Tailings area	61
Bess Investments	Mill site	7
State of Colorado	Effluent-pond area	40
Colorado West Improvements, Inc.	Ore-storage area	85
L. D. Sievers	Tract northeast of the effluent ponds	10

Shortly after the mill was shut down, efforts were made to stabilize the pile. Much of the concrete and brick from demolished mill buildings (7000 cubic yards) was placed as riprap along the river. The rest was placed on the settling ponds, which were then contoured with an estimated 174,000 tons of tailings transferred from the tailings pile. The tailings pile was covered to a minimum thickness of six inches with 87,000 cubic yards of soil. The pile was revegetated and irrigated for some time; however, little vegetation is now present. The entire tailings area is fenced to control access.

4.2.2 Cheney Reservoir site

The Cheney Reservoir site is approximately 18 miles southeast of Grand Junction and five miles southeast of the community of Whitewater. The site lies between Grand Mesa and the Gunnison River along U.S. Highway 50, which connects Grand Junction with the town of Delta.

The site is on Federal land administered by the BLM (Figure 4.4). The site is used primarily for low-density grazing. The area about one mile north of the site, along Kannah Creek, is intensely farmed. There is an existing oil and gas lease on the site. Privately owned land lies to the north, west, and south of the site.

Cheney Reservoir lies about one mile south of the site. This small reservoir is used for livestock and wildlife watering. The

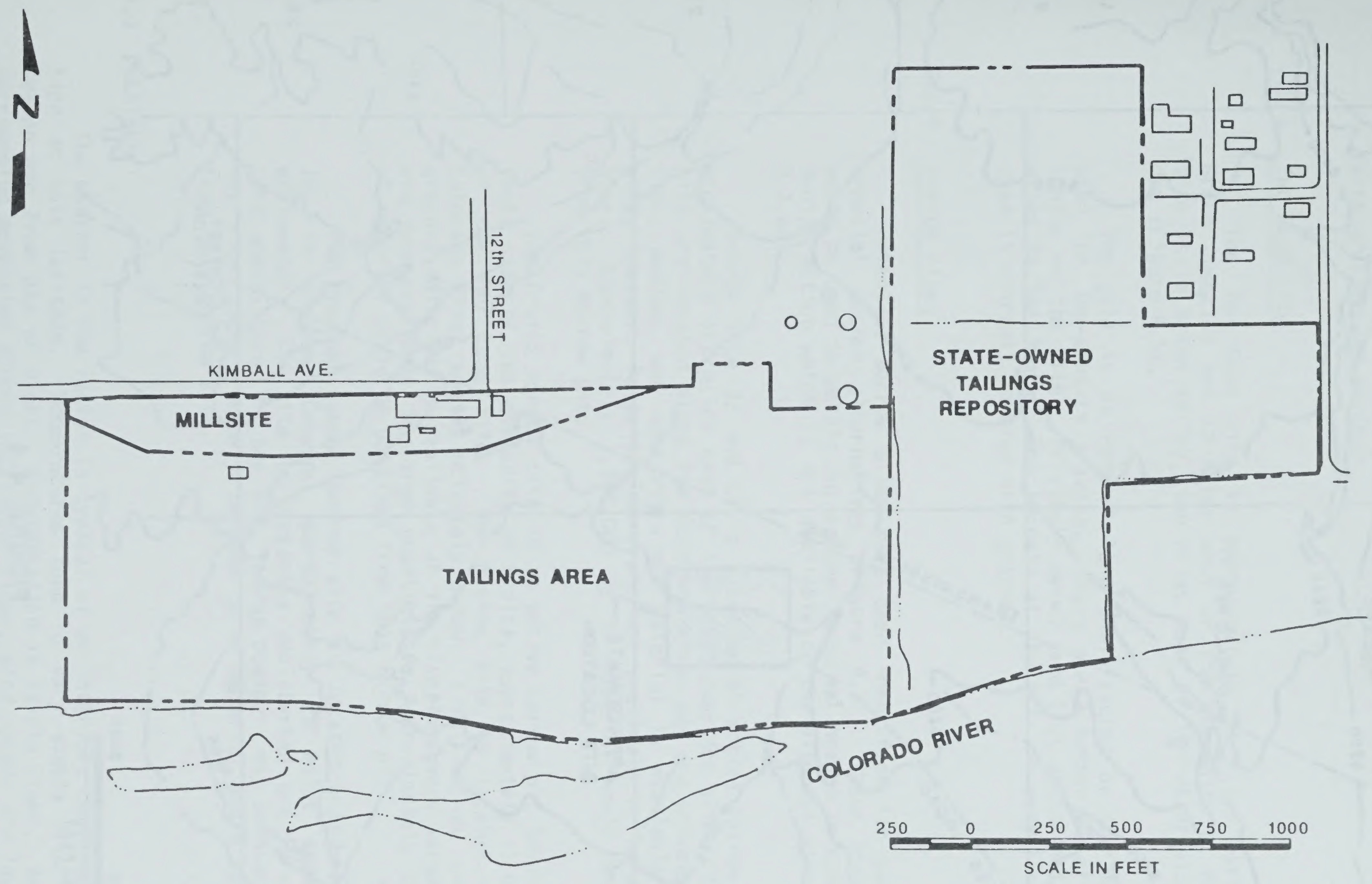


FIGURE 4.3
GRAND JUNCTION SITE MAP

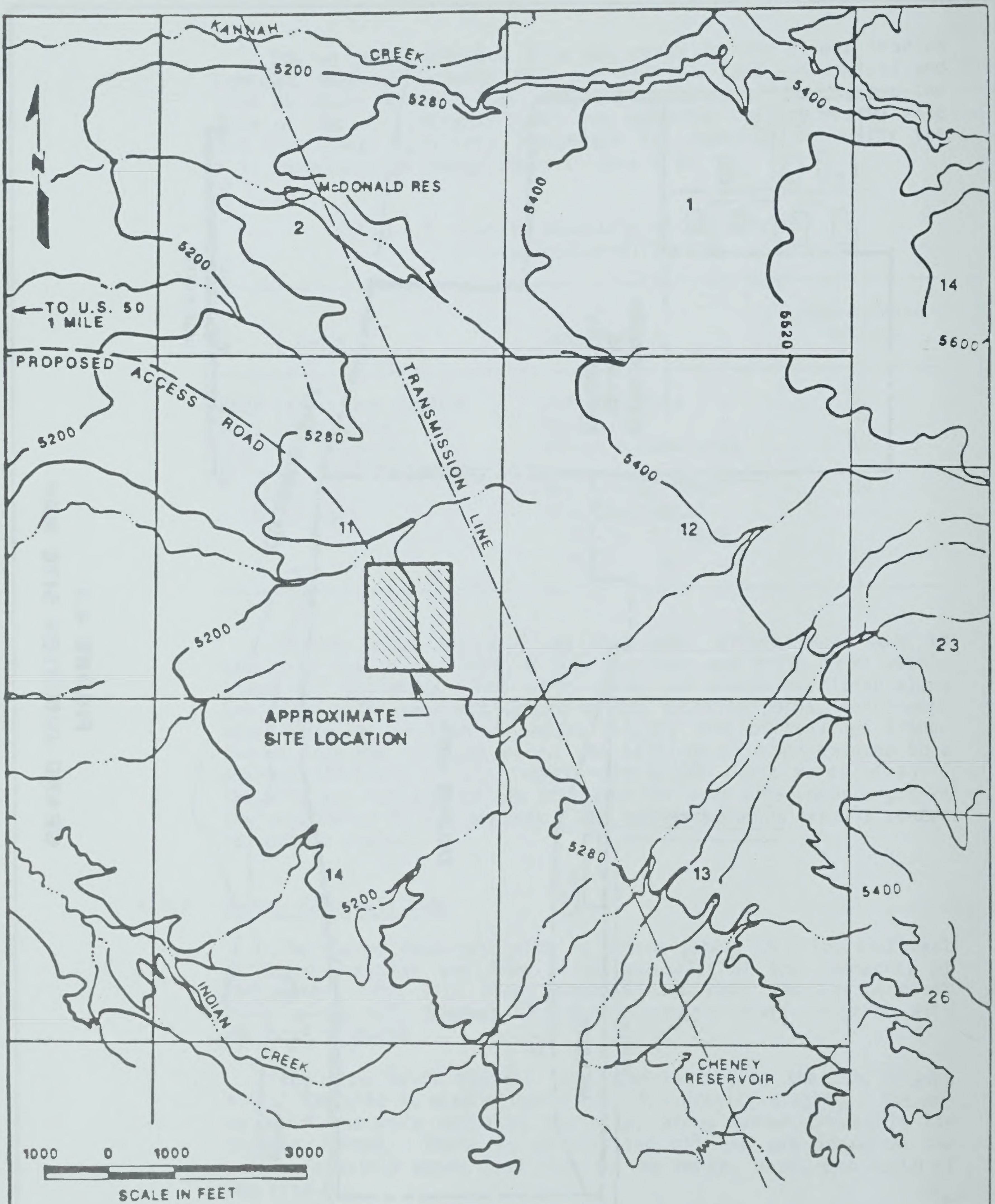


FIGURE 4.4
CHENEY RESERVOIR ALTERNATE DISPOSAL SITE

terrain at the site is very flat and the area is sparsely covered with grasses and shrubs.

4.2.3 Two Road site

The Two Road site is approximately 33 miles northwest of Grand Junction and 10 miles west of the community of Mack. The site is in Grand Valley, two miles east of the Utah/Colorado border (Figure 4.5).

The site is on Federal land administered by the BLM and is used for low-density grazing. There are a number of oil and gas leases on the site. Privately owned land lies approximately three miles to the south. The terrain at the site is very flat and the area is sparsely covered with grasses.

4.2.4 Borrow sites

Potential borrow sites have been identified for each of the remedial action alternatives (Figure 4.6). These borrow sites would be used to obtain any earthen material needed to complete remedial action which is not available at the disposal site (Section 3.2.8).

Borrow site 32 and C½ is a series of active borrow pits approximately six miles east of the Grand Junction site. The borrow pits are located along the Colorado River and are privately owned. Fine, medium, and coarse-grained material is available at these pits; however, large boulders are not available in large quantities. Approximately 1,880,000 cy of material would be obtained from this borrow pit.

The Fruita borrow site is an active borrow pit located on the south side of the community of Fruita, approximately 15 miles east of the Two Road site. The borrow site is located along the Colorado River and is privately owned. Fine, medium, and coarse-grained material is available at the site; however, large boulders are not available in large quantities. Approximately 222,000 cy of material would be obtained from this borrow pit.

The Unaweep Canyon borrow site is located adjacent to Route 141 in Unaweep Canyon, approximately 25 miles southwest of Whitewater. The site is presently undisturbed and is on Federal land administered by the BLM. Large boulders may be quarried from the site. Approximately 269,000 cy of material would be obtained from this borrow site.

4.3 WEATHER

The weather in the region is typical of an interior, continental location at this latitude. Temperatures tend to vary widely from season to season and from day to night. Precipitation is fairly light. Because the surrounding mountains affect local wind flows, wind speeds are low.

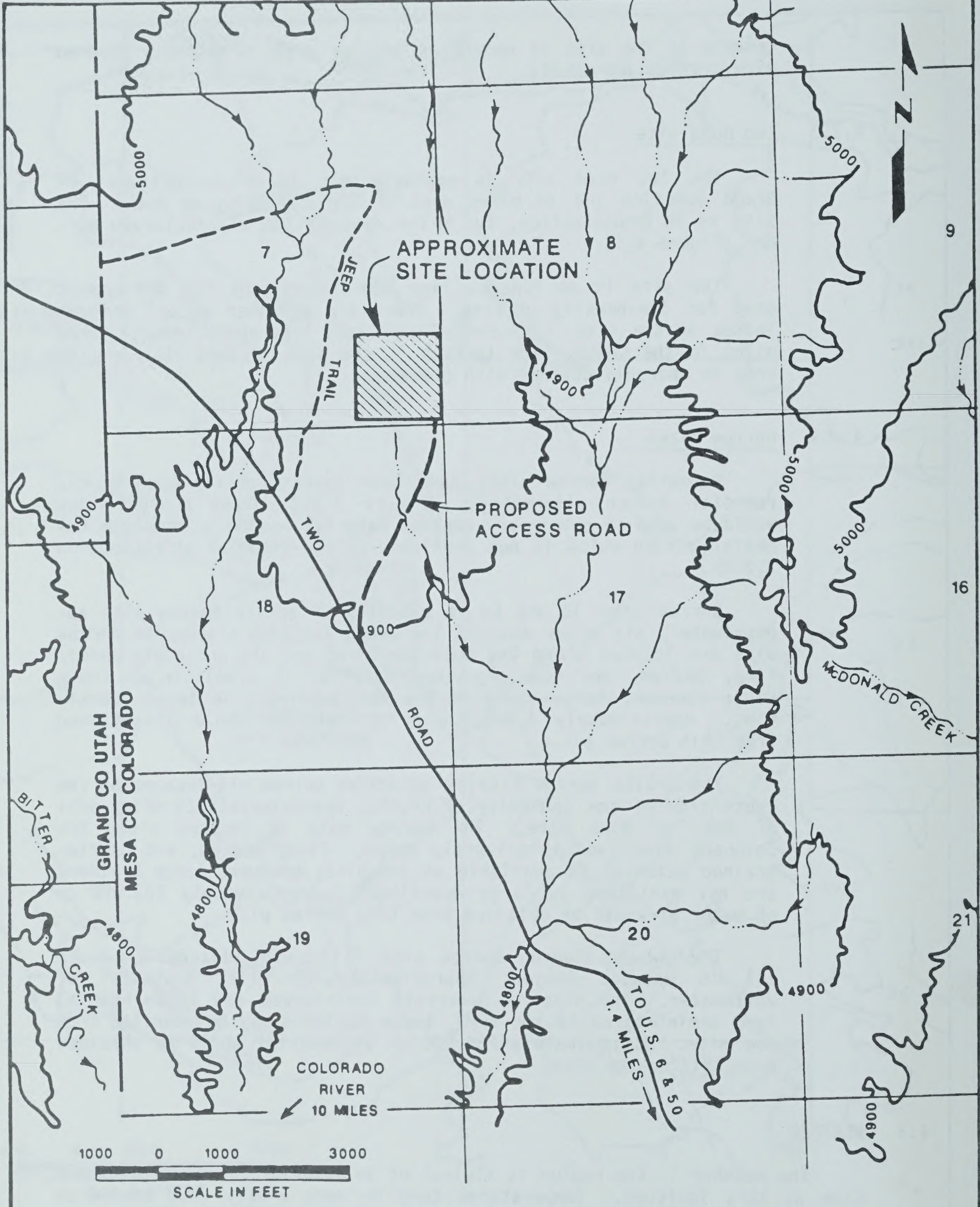


FIGURE 4.5
TWO ROAD ALTERNATE DISPOSAL SITE

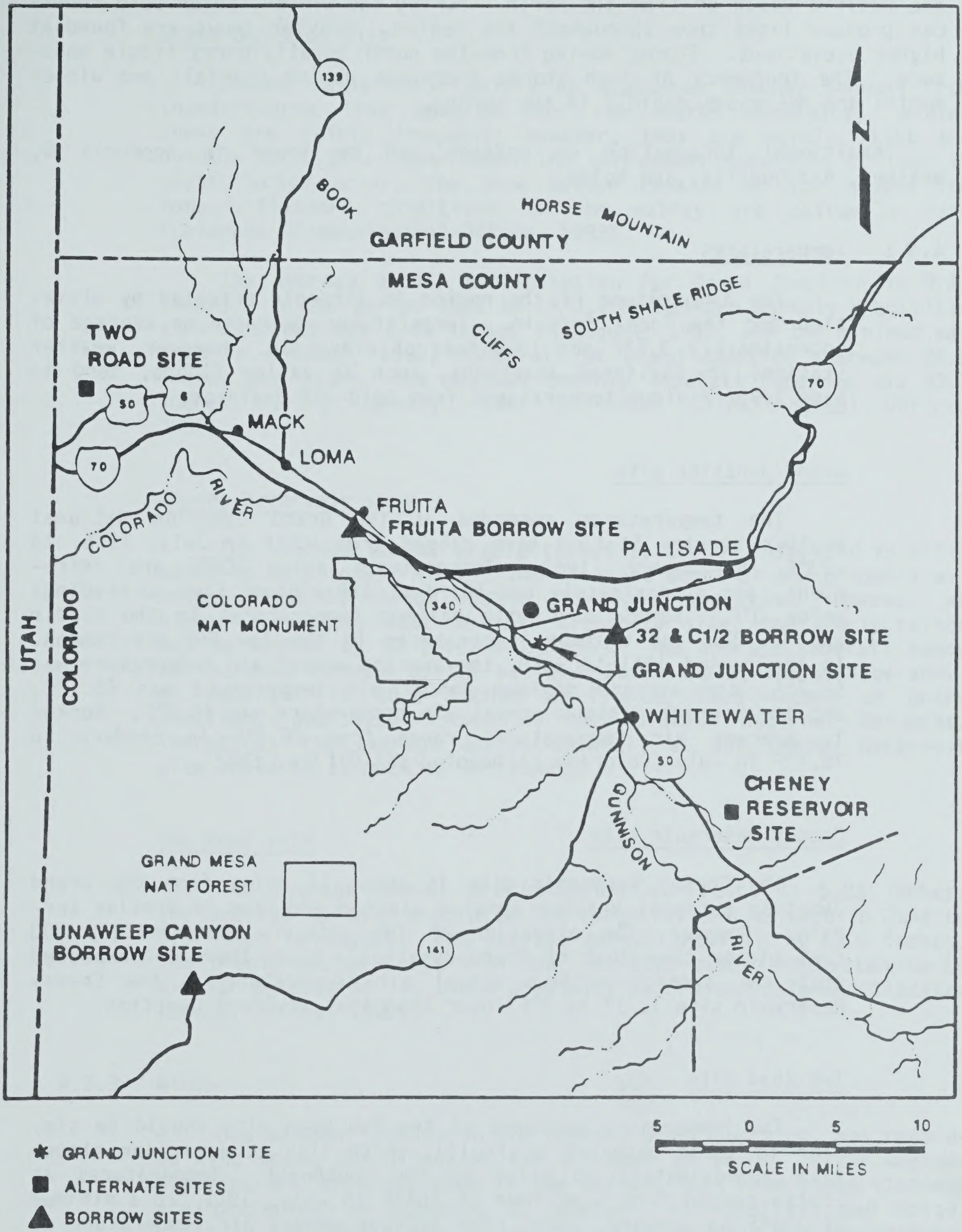


FIGURE 4.6
LOCATION OF BORROW SITES

Changes in the weather are often caused by cold fronts moving from the Pacific Ocean or from the north. During the winter, polar cold fronts can produce light snow throughout the region. Heavier snows are found at higher elevations. Storms moving from the north usually carry little moisture. The frequency of such storms increases during the fall and winter months and decreases rapidly in the spring.

Additional information on weather can be found in Appendix D, Weather, Air Quality, and Noise.

4.3.1 Temperatures

The temperature of the region is strongly affected by elevation and the local terrain. Temperatures decrease an average of approximately 3.5°F per 1000 feet of elevation. However, weather stations in sheltered locations, such as valley floors, tend to have lower minimum temperatures from cold-air drainage.

Grand Junction site

The temperatures recorded at the Grand Junction National Weather Service Station have ranged from 105°F in July, 1976, to -23°F in January, 1963. Temperatures above 100°F are infrequent, and approximately one-third of the winters have no readings below 0°F. Summer days with maximum temperatures in the middle and low 90s and minimum temperatures in the low 60s are common. In the period 1941 to 1970, the average annual air temperature was 52.7°F, the average maximum annual air temperature was 65.1°F, and the average minimum annual air temperature was 40.2°F. Monthly average air temperatures range from 26.6°F in January to 78.7°F in July (Colorado Climatological Office, 1982).

Cheney Reservoir site

The Cheney Reservoir site is about 17 miles from the Grand Junction National Weather Service station and lies in similar terrain. However, the elevation of the site is approximately 500 feet higher than that of Grand Junction. It is therefore expected that the average maximum annual air temperature at the Cheney Reservoir site is 1° to 2°F lower than that at Grand Junction.

Two Road site

The temperature patterns at the Two Road site should be similar to those observed at Fruita, which lies at a similar elevation approximately 20 miles to the southeast. Temperatures at Fruita ranged from a maximum of 104°F in July, 1971, to a minimum of -34°F in January, 1963. The average annual air temperature is 50.4°F, the average maximum annual air temperature is 66.7°F, and the average minimum annual air temperature is 34.0°F. Monthly average air temperatures range from 24.8°F in January to 75.1°F in July (Colorado Climatological Office, 1982).

4.3.2 Precipitation

Grand Junction site

Summer rains occur mainly as scattered intense showers from thunderstorms that develop over the nearby mountains. Winter snows are fairly frequent; however, they are mostly light and quickly melt off. Even when the infrequent snowfalls of four to eight inches occur, the snow seldom remains on the ground for long. Blizzard conditions in the valley are extremely rare (Colorado Climatological Office, 1982).

The average annual precipitation for Grand Junction is 8.41 inches. In the period 1941 to 1970, the maximum monthly precipitation recorded was 3.48 inches in August, 1957, and the minimum was zero in October, 1952. Snowfall at Grand Junction averages 26.5 inches per year. The maximum monthly snowfall recorded was 33.7 inches during January, 1957 (Colorado Climatological Office, 1982).

Cheney Reservoir site

The average annual precipitation at Cheney Reservoir is estimated to be slightly higher than at Grand Junction and probably averages about 10 inches due to its higher elevation. However, at higher elevations east of this alternate site, the precipitation may be higher by 50 percent or more. The average snowfall seems to increase farther up the valley. For example, the average annual snowfall is 18.0 inches at Fruita, 26.5 inches at Grand Junction, and 41.6 inches at the Colorado National Monument. Therefore, the average annual snowfall at the Cheney Reservoir site could be as much as 30 inches.

Two Road site

The average annual precipitation at Fruita is 8.23 inches. The average monthly precipitation ranges from 0.43 inch in June to 0.97 inch in August. The average annual snowfall is 18.0 inches. The precipitation pattern at the Two Road site is expected to be similar because of its close proximity to Fruita (Colorado Climatological Office, 1982).

4.3.3 Winds

One weather station in the region, Grand Junction, has recorded wind speed and direction for a number of years. Other weather stations are also operated in the region; data from these stations are presented in Appendix D, Weather, Air Quality, and Noise. Winds in the region are influenced by large-scale weather patterns and by the complex terrain. The winds affecting the alternate disposal sites are primarily in the lowest 1000 feet of the atmosphere and can vary significantly within short distances. In the region, the winds often exhibit a diurnal reversal in flow, creating mountain and valley breezes. Local heating and cooling during the day and night, respectively, can initiate the flow reversals. On clear nights, the land radiates heat and cools down, thereby cooling the air adjacent to it. The cool, denser air then flows down the mountain slopes into the valleys and lowlands. Since it blows from the mountain, this air flow is called a "mountain breeze." On warm sunny days, the heating of the mountain slopes may generate an upslope flow of air, called a "valley breeze." As the warmer air moves up the mountain, it is replaced by cooler air from above the valley (Critchfield, 1966).

Grand Junction site

The prevailing winds at Grand Junction are from the east-southeast and average 8.1 miles per hour (mph). The next most frequent wind direction is northwest. The distribution is quite constant throughout the year because of the dominance of valley-induced upslope and downslope flows.

Cheney Reservoir site

At the Cheney Reservoir site, the Gunnison River valley is oriented from east-southeast to west-northwest, much as it is at Grand Junction. The wind directions tend to conform to this orientation; the dominant direction is from the south-southeast (upriver); however, a high percentage of winds also blow from the northwest (downriver). The average wind speed at the Cheney Reservoir site is similar to that at the Grand Junction site; it averaged 8.2 mph for the period of September, 1982, through August, 1983.

Two Road site

Wind data collected three miles east of the Two Road site indicate that wind speeds are lower than those recorded at the other two sites (DOE, 1983a). The directions of these winds also appear to be influenced by local topography. The average wind speed measured near the site for the period of February, 1981, through January, 1982, was 5.8 mph. The prevailing winds blow from the northwest. A lower percentage blow from the east.

4.3.4 Storms

Because of the protective influence of the Rocky Mountains, severe weather in the region is rare, although thunderstorms are fairly frequent (about 33 per year). The thunderstorms usually occur during the summer and occasionally produce hail. No tornadoes were reported in the region during the period 1930 to 1974 (Abbey, 1976).

Gusty surface winds are rather frequent in the spring and early summer. The strongest winds are usually from the south and southwest, and are associated with thunderstorms or with weather preceding cold fronts. The highest wind speed recorded at Grand Junction in the period 1941 to 1970 was 66 mph in June, 1951.

The maximum 24-hour rainfall recorded was 1.57 inches in June, 1969, and the maximum monthly precipitation was 3.48 inches in August, 1957. Large snowfalls are rare. The maximum snowfall recorded at Grand Junction was 9.1 inches in January, 1957, (Colorado Climatological Office, 1982).

4.4 AIR QUALITY

The quality of air in Mesa County is generally good. The concentrations of five of the six "criteria" pollutants--sulfur dioxide, ozone, nitrogen dioxide, carbon monoxide, and lead--are below the levels specified by the U.S. Environmental Protection Agency (EPA) in its National Ambient Air Quality Standards. However, the concentration of total suspended particulates exceeds the standards in one portion of the county; the urbanized area around Grand Junction. The high concentrations of particulates are largely attributed to windblown dust from exposed soil. This "nonattainment" area for particulates extends from Fruita east to Palisade. The Cheney Reservoir and the Two Road sites are outside the nonattainment area; the Grand Junction tailings site is inside it.

In the areas where the standards for total suspended particulates are not attained, the State of Colorado requires control measures for any construction or transportation activities. Table 4.2 contains the air-quality standards established by the EPA and the State of Colorado.

4.5 SURFACE AND SUBSURFACE FEATURES

4.5.1 Soils

Grand Junction site

The site is situated on a young (late Holocene) alluvial terrace three to six feet above the present level of the Colorado River. A thin layer of soil has been placed on the tailings for partial stabilization. The tailings, which are finely ground rock fragments, form a deposit that is approximately 10 feet thick at the western end of the site and as much as 52 feet thick in the northeastern part. The tailings range from fairly clean sands (fine to medium in grain size) to nonplastic, silt-sized material.

The naturally occurring soils beneath the tailings range in thickness from zero to about five feet and consist of a thin layer of sandy silt overlying coarse river alluvium. It is underlain by sandy gravel, cobbles, and occasional boulders (alluvium deposited by the Colorado River). The gravel layer is five to 15 feet thick beneath and in the vicinity of the tailings pile. The gravel materials are fairly permeable and contain few fines (DOE, 1983a).

Table 4.2 National and Colorado standards for ambient air quality[a]

Pollutant	Averaging time	Primary standard		Secondary standard
Sulfur dioxide				
National	Annual arithmetic mean	80		--
	24-hour[b]	365		--
	3-hour[b]	--		1300
		Category I (incremental)	Category II (incremental)	Category III (incremental)
State	Annual arithmetic mean	2	10	15
	24-hour maximum[b]	5	50	100
	3-hour maximum[b]	25	300	700
Total suspended particulates[c,d]	Annual geometric mean	75		60[e]
	24-hour[b]	260		150
Carbon monoxide[c,d]	8-hour[b]	10,000		10,000
	1-hour[b]	40,000		40,000
Ozone	1-hour[c]	235		235
	1-hour[d]	160		--
Nitrogen dioxide[c,d]	Annual arithmetic mean	100		100
Lead[c]	Calender quarter average	1.5		1.5

[a] All concentrations are in micrograms per cubic meter.
[b] Not to be exceeded more than once per year.
[c] National Ambient Air Quality Standard.
[d] Colorado Ambient Air Quality Standard.
[e] An annual geometric mean of 60 micrograms per cubic meter has been established by the State of Colorado as a guide to be used in assessing implementation plans to achieve compliance with the 24-hour standard.

The channel morphology of the Colorado River adjacent to the site is island-braided. Recorded information indicates that the river has been stable at this location for about the past 100 years. Upstream and downstream of the site, the river displays a meandering pattern, indicative of a less stable river. For additional information on channel morphology, see Appendix E, Soils, Geologic, and Seismic Information.

Cheney Reservoir

At the Cheney Reservoir site, the thickness of the subsurface deposits, which consist of alluvial, colluvial, and eolian deposits, ranges from about 23 to 42 feet in depth. At the surface, an eolian derived silt with some clay and sand and occasional gravel to boulder size basalt fragments ranges from zero to three feet thick. Underlying the silt is a mixture of alluvium and colluvium deposits. These deposits consist of interlayered clay, silt, sand, and gravel with occasional layers of basalt cobbles and boulders (SHB, 1985a). This layer apparently represents mixed alluvial and debris flow deposits.

Several ephemeral washes draining from the higher elevations are present on and near the site. Drainages on the site are occasionally incised to depths of five feet or more and a few have steep banks indicative of rapid erosion.

The remainder of the site area is relatively stable as indicated by the relatively smooth, undissected nature of the site and the existence of fine-grained eolian soil at the surface (SHB, 1985b). Erosion of the ephemeral gullies on the site appears to be the major geomorphic hazard at the Cheney Reservoir site.

Two Road site

The Two Road site is on two broad, relatively flat pediment surfaces formed by the erosion of the Mancos Shale. The dominant materials present in the site area are residual soils formed by weathering of the Mancos, pediment gravels, and eolian deposits.

The surface layer of eolian deposits, which consists of clayey silt and fine sand, ranges from one to six feet in depth. Below the eolian deposits are pediment deposits which consist of interlayered sand and gravelly sand, with occasional gravel lenses. These deposits range from about 15 to 25 feet in thickness and may extend to depths of 30 feet or more in localized areas. The pediment deposits are generally very strongly cemented by caliche (SHB, 1985c).

The rate of erosion on the site is very slow. The drainage systems on the site are characterized by very gentle, grassy slopes and lack deeply incised channels although incised gullies flank the site on the east and west. The deeper washes flanking the site are intermittent streams draining from the Book Cliffs to the north. The dominant erosion processes currently acting on the site surface are wind, sheet wash, and solifluction movements (SHB, 1985c).

Vicinity properties

The vicinity properties consist of a variety of commercial as well as residential structures and open lands within Mesa County. As a result, the soils associated with the vicinity properties are varied and disturbed. Generally speaking, the soils in the valley floor are alluvial type soils, while those on the surrounding mesas are eolian influenced.

Borrow sites

The 32 and C½ and Fruita borrow sites are areas of either ongoing or one-time disturbances. Therefore, soil no longer exists at these sites.

No soils are present at the Unaweep Canyon borrow site because rock outcrops at the site.

4.5.2 Geology

Regional geology

The Grand Junction, Cheney Reservoir, and Two Road sites are all located in the Canyon Lands section of the Colorado Plateau physiographic province. This province is characterized by deeply incised river channels flowing through sedimentary rocks, exposing large cliffs and flat mesas.

Underlying the Grand Junction area are sedimentary rocks ranging in age from Triassic to Upper Cretaceous. Figure 4.7 shows the general stratigraphy of the study area. The first bedrock unit at each of the sites is the Mancos Shale which contains many horizontal as well as frequent and persistent vertical fractures. The fractures often contain gypsum and occasionally calcite (Lohman, 1965).

The Precambrian crystalline rocks and the well-cemented beds in the Kayenta, Summerville, Morrison, Burro Canyon, and Dakota Formations are cut irregularly, mainly by vertical fractures. The Wingate Sandstone contains vertical fractures in many places; however, when exposed in cliffs it is massive with few fractures. The Slick Rock Member of the Entrada Sandstone has an almost total absence of fractures. More information about jointing in these units can be found in the report by Lohman (1965).

Twelve miles southwest of Grand Junction, the structure of the sedimentary rocks is dominated by the Uncompahgre Arch (Figure

SYSTEM	SERIES	FORMATION	MEMBER	THICKNESS	CHARACTER
CRETACEOUS	UPPER CRETACEOUS	MANCOS SHALE		TOP NOT EXPOSED	GRAY MARINE SHALE: FEW THIN BEDS OF LIMESTONE. UNDERLIES GRAND VALLEY & FORMS BOOK CLIFFS
		DAKOTA SANDSTONE		150 ±	COARSE WHITE BASIL CONGLOMERATE, LIGNITIC SHALE, BUFF SANDSTONE & THIN BEDS OF LIGNITE. SANDSTONE FORMS EDGES & CLIFFS
					EROSIONAL UNCONFORMITY
	LOWER CRET.	BURRO CANYON FORMATION		50-120	BUFF SANDSTONE, GENERALLY IRON STAINED, & GREEN-HUED SILTSTONE & MUDSTONE: SANDSTONE LOCALLY CONGLOMERATIC. FORMS CLIFFS WHERE LARGELY SANDSTONE
JURASSIC	UPPER JURASSIC	MORRISON FORMATION	BRUSHY BASIN MEMBER	260-340	MAINLY RED, GREEN, BROWN , PURPLE, & GRAY-WHITE SILT STONE & MUDSTONE: CONTAINS SOME BENTONITIC BEDS & A FEW THIN BEDS OR LENSES OF WHITE TO BROWN & LIMESTONE
			SALT WASH MEMBER	190-312	SIMILAR TO BRUSHY BASIN MEMBER, BUT CONTAINS THICK LENTICULAR SANDSTONE BEDS & IN LOWER PART, THIN BEDS OF DOVE GRAY LIMESTONE
		SUMMERVILLE FORMATION		40-60	RED, GREEN, GRAY, PURPLE, & BROWN MUD-STONE & SILTSTONE & PERSISTENT THIN BEDS OF HARD SANDSTONE, SOME RIPPLE MARKED
		ENTRADA SANDSTONE	MOAB MEMBER	60-200	WHITE TO GRAY EVENLY BEDDED FINE-GRAINED SANDSTONE, SOME RIPPLE MARKED
			SLICK ROCK MEMBER		SALMON-COLORED TO PINK FINE-GRAINED GENERALLY CROSSBEDDED SANDSTONE, CONTAINING SCATTERED GRAINS OF MEDIUM TO COARSE-GRAINED SAND. FORMS CLIFFS
					EROSIONAL UNCONFORMITY
TRIASSIC (?)	UPPER TRIASSIC	KAYENTA FORMATION		0-127	MEDIUM TO COARSE GRAINED HIGHLY LENTICULAR HARD SANDSTONE: SOME LENSES OF RED & PURPLE SILTSTONE & MUDSTONE: & SOME LENSES OF CONGLOMERATE & CONGLO-MERATIC SANDSTONE, FORMS BENCHES
TRIASSIC	UPPER TRIASSIC	WINGATE SANDSTONE		215-370	THICK BEDS OF SALMON-COLORED TO BUFF FINE-GRAINED GRAINED GENERALLY CROSS BEDDED SANDSTONE. FORMS CLIFFS: MANY CLIFF FACES COATED WITH DESERT VARNISH.
		CHINLE FORMATION		80-120	RED SILTSTONE CONTAINING A FEW THIN LENSES OF GREEN HUED LIMESTONE OR CONGLOMERATE, FORMS SLOPES
					GREAT UNCONFORMITY
PRECAMBRIAN COMPLEX				BASE NOT EXPOSED	SCHIST, GNEISS, GRANITE, & PEGMATITE DIKES

AFTER LOHMAN, 1965

FIGURE 4.7
GENERALIZED SECTION OF ROCK FORMATIONS IN THE GRAND JUNCTION AREA, COLORADO, EXCLUDING QUATERNARY DEPOSITS

4.8), a northwest-trending asymmetrical block. The uplift is bounded on the southwest and the northwestern flank by abrupt, locally faulted monoclines. Major faults within the vicinity of the sites are the Redlands Fault and the Jacobs Ladder Fault complex. Figure 4.9 shows the tectonic setting of the region and Figure 4.10 shows the locations of potentially active faults associated with the Uncompahgre Uplift. Evidence indicates that the Uncompahgre Arch was uplifted as recently as three million years ago (late Pliocene or early Pleistocene) (Lohman, 1981). There is some disagreement between various investigators on the question of whether tectonic activity essentially stopped before or shortly after the end of the Tertiary or has continued to the present time (SHB, 1985a).

The Grand Junction area is located within the stable interior portion of the Colorado Plateau, but within a few miles of potentially active faults associated with the Uncompahgre Uplift. Evidence for late Quaternary to Holocene movements on these faults is not conclusive and they may not be active at this time (SHB, 1985d).

Kirkham and Rogers (1981) estimate a Maximum Credible Earthquake (MCE) of 5.5 to 6.5 for the Colorado Plateau. Based on this estimate, conservative probabilistic analysis of the frequency of occurrence of random earthquakes within the entire Colorado Plateau indicates that each of the disposal sites would likely experience an acceleration in the range of 0.15 to 0.23g at least once in the next 1000 years (SHB, 1985d). The largest instrumentally recorded earthquakes within the interior of the plateau have ranged in magnitude from 4.5 to 5.5 on the Richter scale.

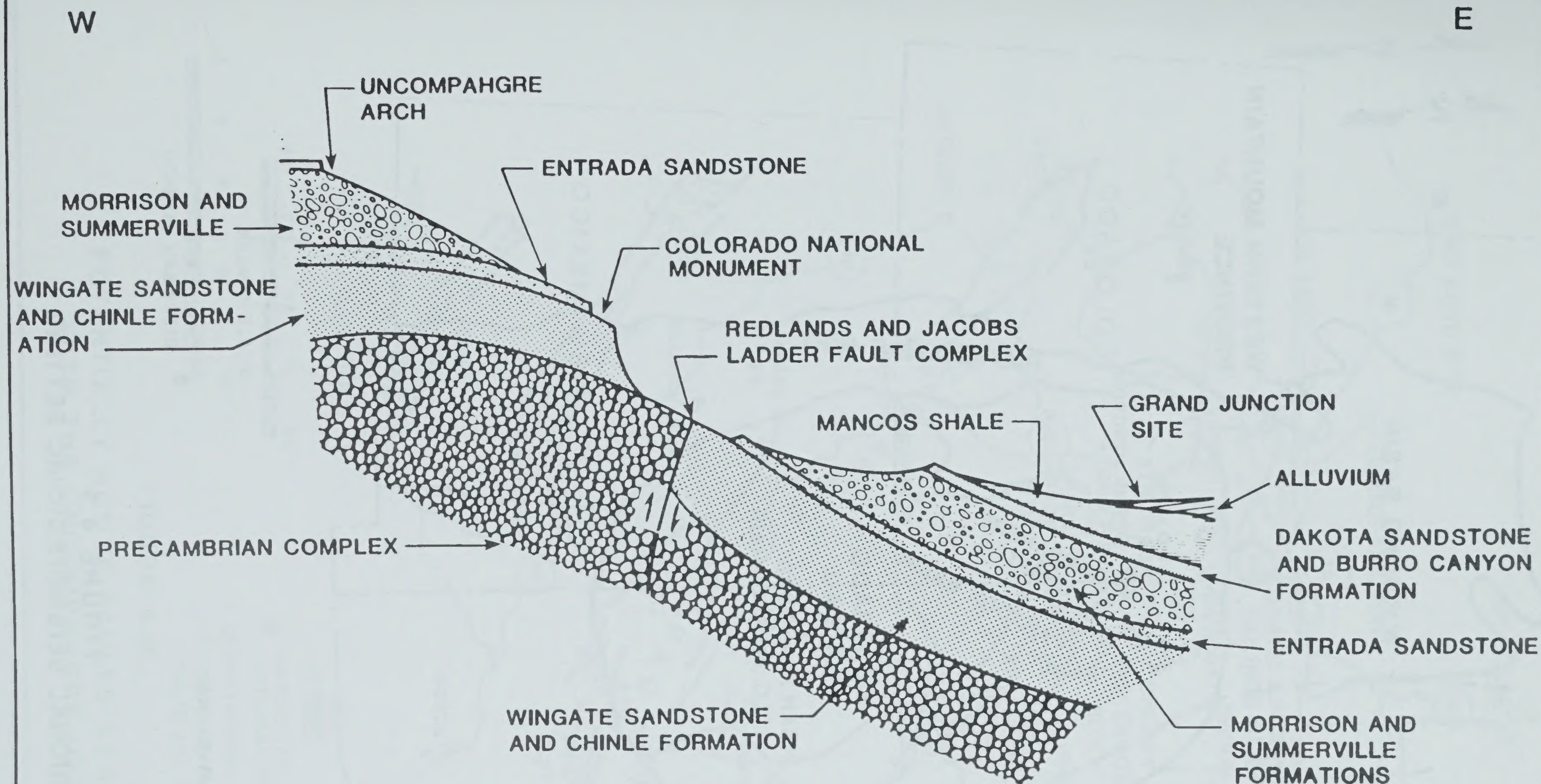
Grand Junction site

The Grand Junction site is located adjacent to and on the north side of the Colorado River. The alluvium present beneath the tailings is five to 15 feet thick and consists of sandy gravel, cobbles, and some boulders deposited by the Colorado River. On the south side of the river, Mancos Shale is exposed in the cliff bank above the river. The Mancos Shale is continuous underneath the Grand Junction site and dips at approximately three degrees to the northeast (Cashion, 1973). It is approximately 150 feet thick on the east side of the site and 50 feet thick on the west side.

If the faulting associated with the Uncompahgre Uplift is considered active, movement along the faults could produce accelerations as high as 0.34g at the existing Grand Junction site (SHB, 1985d).

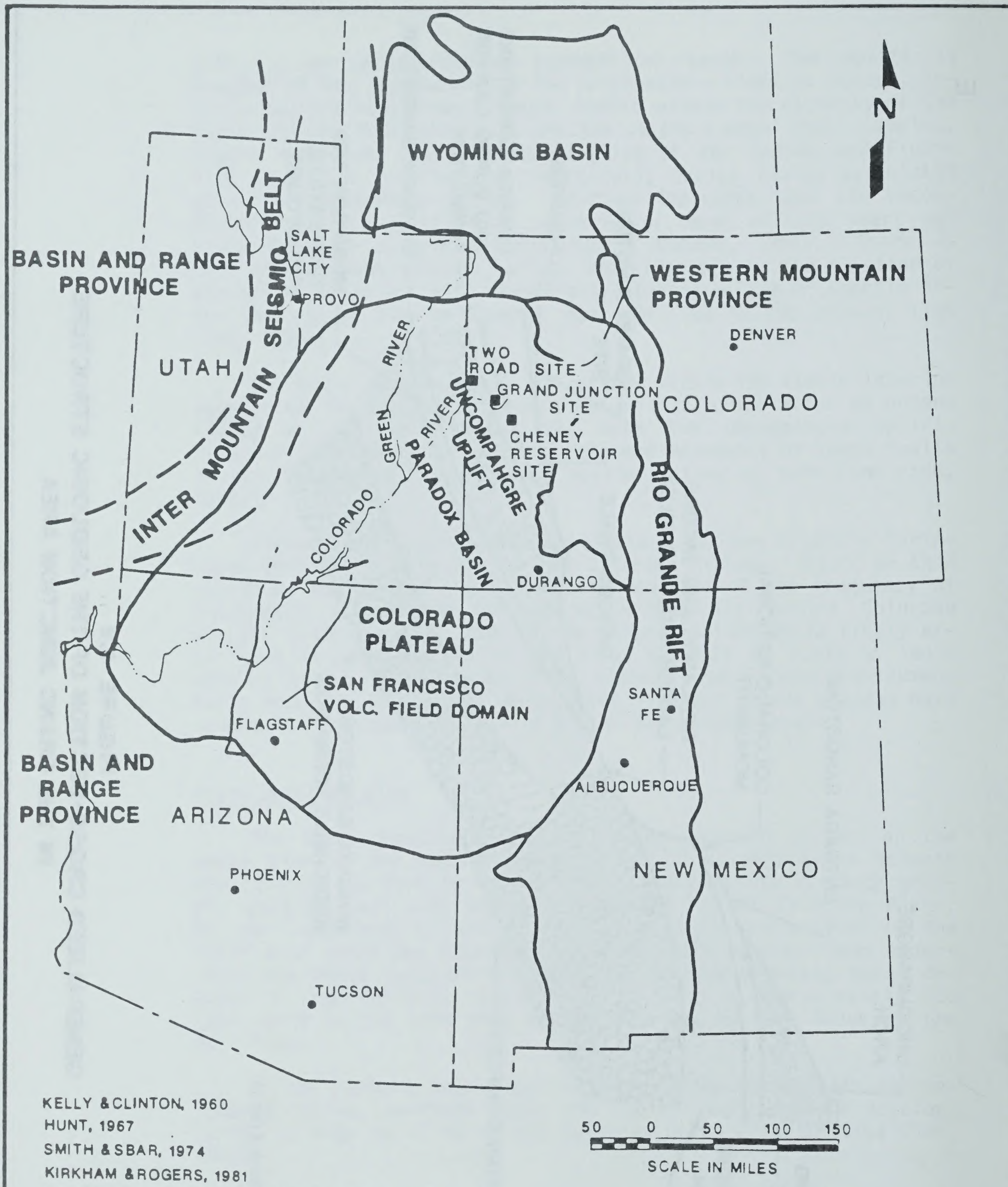
Cheney Reservoir site

Alluvial material at the Cheney Reservoir site is approximately 23 to 42 feet thick. The uppermost bedrock unit at the site is the Mancos Shale. Its thickness at the site is approximately 300



SOURCE: LOHMAN (1981)

FIGURE 4.8
GENERALIZED CROSS-SECTION OF THE GEOLOGIC STRUCTURE IN THE GRAND JUNCTION AREA



KELLY & CLINTON, 1960
HUNT, 1967
SMITH & SBAR, 1974
KIRKHAM & ROGERS, 1981
NEW MEXICO GEOLOGICAL SURVEY, 1982
MENGES, 1983
PEARTREE & OTHERS, 1983

FIGURE 4.9
REGIONAL SEISMOTECTONIC SETTING

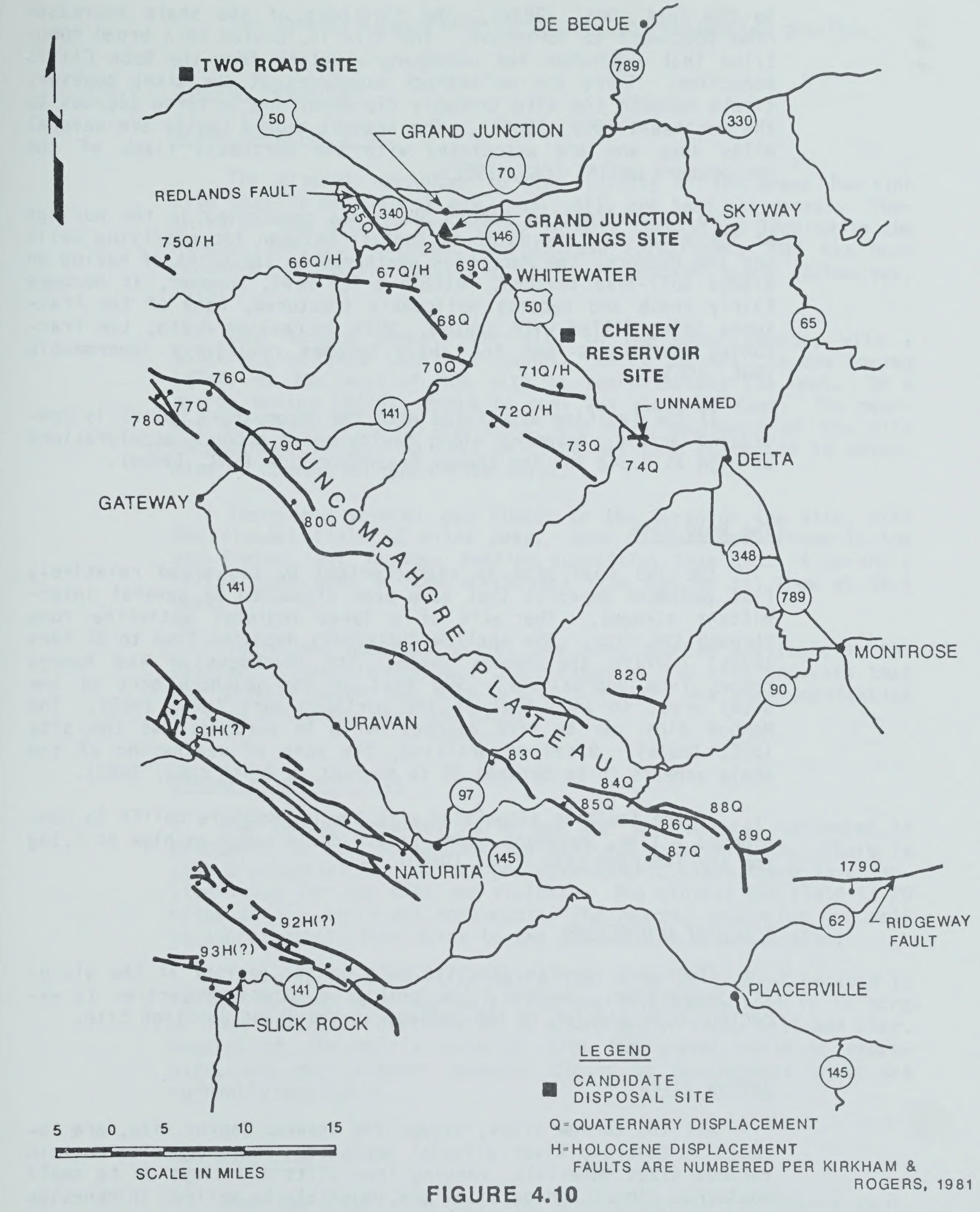


FIGURE 4.10

POTENTIALLY ACTIVE FAULTS ASSOCIATED WITH THE UNCOMPAHGRE UPLIFT

to 700 feet (DOE, 1983a). The thickness of the shale increases from southwest to northeast. The site is located on a broad homocline that separates the Uncompahgre Uplift from the Book Cliffs monocline. There are no bedrock exposures at the site; however, strata beneath the site probably dip about one to three degrees to the northeast (DOE, 1983a). The nearest mapped faults are several miles away and are associated with the northeast flank of the Uncompahgre Uplift (CGS, 1982).

Up to 30 feet of Mancos Shale was penetrated in the borings at the site. At the point of contact between the overlying soils and the bedrock, the Mancos is weathered to the point of having an almost soil-like texture. Within a few feet, however, it becomes fairly fresh and becomes noticeably fractured, many of the fractures being filled with gypsum. With increasing depth, the fracturing diminishes and the shale becomes relatively impermeable (DOE, 1983a).

If the faulting associated with the Uncompahgre Uplift is considered active, movement along faults could produce accelerations as high as 0.34g for the Cheney Reservoir site (SHB, 1985d).

Two Road site

The Two Road site is characterized by two broad relatively flat pediment deposits that have been dissected by several intermittent streams. The axis of a large regional anticline runs through the site. The shallow Quaternary deposits (two to 31 feet thick) overlie the Mancos Shale. The thickness of the Mancos ranges from approximately 500 feet in the southern part of the study area, to 1400 feet in the northern part (URS, 1983). The Mancos dips two to five degrees north to northwest at the site (DOE, 1983a). Based on drilling, the zone of weathering of the shale appears to be between 20 to 60 feet in depth (URS, 1983).

If the faulting associated with the Uncompahgre Uplift is considered active, movement along faults could range as high as 0.18g for the Two Road site (SHB, 1985d).

Vicinity properties

There are no-site specific data on the geology at the vicinity properties. However, the geology at these properties is expected to be similar to the geology at the Grand Junction site.

Borrow sites

All the borrow sites, except the Unaweep Canyon site, are located in Colorado River alluvial deposits. These deposits contain various sized materials, ranging from silts and clays up to small boulders. These borrow sites are underlain by various thicknesses of Mancos Shale.

The Unaweep Canyon site is located in Precambrian granite.

4.5.3 Mineral resources

Grand Junction site

The mineral resources in the vicinity of the Grand Junction site consist of natural gas, coal, oil, and sand and gravel. One-third of the natural gas fields in Mesa County are located in the Mancos, Dakota, Morrison, and Entrada Formations. Oil has been produced in small quantities only in recent years (Schwochow, 1978).

Coal occurs beneath the site in the upper Dakota, with a thickness of less than six inches. Depth to coal in one boring (#724) at the west of the site is approximately 110 feet. In a nearby boring (#725), depth to coal was about 65 feet. The nearest outcrops of coal are about one mile southwest of the site (Schwochow, 1978). No test drilling has been conducted to determine if commercial quantities exist.

There are several gas fields to the north of the site, with the closest field 12 miles away. Some oil has been found in the gas fields, but in much smaller quantities than gas. A borehole (#725) just west of the processing site had an oil show at 96.5 feet.

There are numerous gravel and sand sources available in the Colorado River floodplain. The borings at the site indicate that the gravels under the pile are thin. There are more substantial sources elsewhere near the site.

Cheney Reservoir site

The Cheney Reservoir site has the same mineral resources as discussed for the Grand Junction tailings disposal site. There is also a potential for oil and gas development, since there is an active lease for the site and vicinity. The closest gas field is 20 miles to the north and northeast. The nearest producing gas well is approximately four miles to the east of the disposal site.

The gravel at the site has a low value at present because it is not located near any major planned development and it is more or less uniformly distributed in a matrix of sandy silt and clay. Removal of the matrix material from the gravel would be expensive, and much cleaner deposits closer to development areas are currently available.

Two Road site

The Two Road site has the same potential for Dakota coal, oil, and gas development as the Cheney Reservoir site. There are several active oil and gas leases for the disposal site. The nearest producing well is four miles north of the Two Road site. Sand and gravel are found within the pediment deposits on the site. The distance of the gravel and sand deposits from potential construction activities within the region precludes the use of the materials.

Vicinity properties

There are no mineral resources associated with the vicinity properties.

Borrow sites

All the borrow sites, except the Unaweep Canyon site, are existing commercial sand and gravel operations. Mineral resources at the Unaweep Canyon site are unknown, other than the presence of suitable rock for riprap. The site is near the Unaweep copper district.

4.6 WATER

4.6.1 Surface water

Section 4.6.1 describes the regional surface-water regime, as well as surface-water conditions at the Grand Junction tailings site, the alternate sites, and the borrow sites. A more detailed discussion of surface-water features, flood analysis, and surface-water quality for each site is contained in Appendix F, Hydrology Report. In addition, information on the floodplain associated with the disposal sites is contained in Appendix G, Floodplain and Wetlands Assessment.

Regional conditions

The Grand Junction tailings site, the alternate disposal sites, and the borrow sites are all in the Colorado River basin. The main stem of the Colorado River has its headwaters high in the Rocky Mountains of central Colorado on the west side of the Continental Divide. Its drainage area upstream from Grand Junction is approximately 8150 square miles. The principal tributaries of the Colorado River in Colorado are the Roaring Fork, Gunnison, and Dolores Rivers. The Roaring Fork joins the Colorado upstream from the sites; the Gunnison, the largest of these tributaries, joins it at Grand Junction; and the Dolores joins it downstream from the sites in Utah.

In the Colorado River near DeBeque, upstream of Grand Junction, the average minimum monthly flows from 1966 through the present were on the order of 1580 cubic feet per second, and the average maximum monthly flows were approximately 11,200 cubic feet per second. The seven-day 10-year low flow (average minimum seven-day flow occurring once in 10 years) was 1140 cubic feet per second. Downstream from the sites, at the Colorado-Utah border, the average minimum and maximum monthly flows from 1951 through the present were approximately 3140 and almost 16,700 cubic feet per second, respectively, and the seven-day 10-year low flow was 1230 cubic feet per second. The higher flows are attributable mainly to the Gunnison River.

In general, the quality of water in the Colorado River depends on the flow, and the flow is determined by the source of water. During low-flow periods, when surface runoff is low and the river flow is primarily discharged ground water, the concentration of metals and inorganics leached from the soil is high. During high-flow periods, when the river flow is primarily surface runoff, the concentration of metals and inorganics is low and the concentration of organics and suspended solids is high (DOE, 1983a).

<u>Grand Junction tailings site</u>

The tailings pile at the Grand Junction site is on the north side of the Colorado River about 0.75 mile upstream from its confluence with the Gunnison River. The Colorado River is braided by several islands from the upstream end of the pile to a point about 0.5 mile past its downstream end. The northern channel of the braided segment passes extremely close to the toe of the pile. The southern side of the river banks against a steep cliff composed of Mancos Shale.

The northern bank of the river along the site boundary is now partially stabilized with riprap, consisting of broken concrete slabs and blocks of concrete, bricks, and "river-run" gravels. The crest of the protected bank is about 15 feet above the surface of the river.

The only surface-water bodies at the site are two drainage ditches, one located east and one west of the pile, that divert overland runoff around the tailings pile to the Colorado River.

The basin upstream of the site comprises 8150 square miles of steeply sloped terrain. Major tributaries to the upper Colorado River include the Roaring Fork River, Eagle River, and Blue River. Elevations in the basin range from 4560 feet at Grand Junction to more than 14,000 feet in the highest headwater areas.

The tailings site is in a meander path of the Colorado River and lies on five to 15 feet of unconsolidated alluvial material. Particle sizes of the alluvium at the site vary from cobbly gravels to gravelly sands which are not large enough to inhibit meandering of the river.

As discussed by Schumm and Harvey (1983), no major shift in location of the Colorado River channel at the site has occurred in the past 100 years. However, the meandering patterns displayed both upstream and downstream of the site are characteristic of less stable rivers. There is evidence that significant shifts have recently occurred in the reach upstream of the site. Cutoff meander loops, abandoned channels, and oxbow lakes are evident on topographic maps and aerial photographs. Similar features are evident south of the confluence with the Gunnison River but not in the immediate area of the Grand Junction site. However, the much greater density of human activities in this area may have obliterated natural contours. A detailed geomorphic evaluation of the site is provided in Appendix E, Soils, Geologic, and Seismic Information.

The flooding of June to July, 1884, is considered the most severe known on the upper Colorado River (COE, 1976). This flood resulted from rapid melting of the snow pack and concurrent heavy rains. In recent times, the floods of 1983 and 1984 were the most severe (33,500 cfs and 39,300 cfs, respectively as measured near Cameo, Colorado). The 1884 flood peak was approximately 73,600 cubic feet per second (cfs) at Grand Junction, if discharge versus area relationships of the 1984 flood are representative. Other floods on the Colorado River were recorded in 1917, 1920, 1921, 1935, 1952, and 1957.

A flood analysis was performed to assure that the remedial action design satisfactorily addresses short-term and long-term flood protection. Short-term flood protection simply defines the extent of the 100-year and 500-year flood and the impact, if any, on the stabilized tailings or on remedial action construction activities. To accomplish the objective of long-term flood protection, DOE determined the magnitude and potential impacts resulting from a Probable Maximum Flood (PMF) event and designed the site to withstand the PMF.

A 100-year flow of 61,000 cfs and a 500-year flow of 84,200 cfs were determined for the Colorado River at the Grand Junction site using methods described in Appendix F, Hydrology Report. The results of this analysis indicate that the site is within the 100-year floodplain. The maximum water level at the site during a 100-year event varied from 4572 to 4576 feet along the pile with mean velocities of six to 10 fps. During a 500-year flood event, the water surface at the site varies from 4574 to 4578 feet along the pile with mean velocities of six to 12 fps.

The estimated PMF at Grand Junction was 889,000 cfs, which is 11 times the estimated 500-year peak and 12 times the maximum recorded flow. A PMF occurring in only the Colorado River above the site was found to be slightly more critical than a PMF occurring in the Gunnison River and Colorado River simultaneously. For the first condition a floodway 4000 to 8000 feet wide would be required to convey the PMF. Many residential and industrial structures would be inundated and all sides of the site would be exposed to channel flow. The peak water surface elevation was estimated to vary from 4589 to 4600 along the pile and mean channel velocities were estimated to be approximately 12 to 19 fps. The maximum scour level was estimated at 12.4 feet below the channel bottom.

There are no major domestic users of Colorado River water for 200 miles downstream from Grand Junction. The normal water supplies for Grand Junction are obtained from Grand Mesa surface water, with the Juniata and Purdy Mesa Reservoirs as the primary sources. During dry spells, Grand Junction uses Gunnison River water; the intake is approximately one mile upstream from the confluence with the Colorado River. The Ute Water District uses Colorado River water during dry spells; its intake is just upstream of Palisade and therefore upstream from the pile.

Cheney Reservoir site

The Cheney Reservoir site is located on a pediment surface that forms a divide between two small ephemeral washes, one approximately 800 feet north of the proposed pile location and one approximately 1700 feet to the south. These washes merge with Indian Creek, 0.1 to 0.5 mile below the site. Indian Creek flows into Kannah Creek, four to five miles below the ephemeral wash confluences, and Kannah Creek empties into the Gunnison approximately two miles below the Indian Creek confluence.

An area of approximately 240 acres drains toward the Cheney Reservoir site. Slopes in the watershed range from two to five percent. Elevations range from 5250 feet to approximately 5600 feet above mean sea level. The maximum flow length is approximately 8000 feet.

Sheet wash and rill erosion are the primary erosive forces currently active on the Cheney Reservoir site; washes on the site are occasionally incised to a depth of five feet. Minor gullying is occurring on the small ephemeral washes that flank the site. Moderate to intense gullying was observed along Indian Creek. Most of the Cheney Reservoir site is classified as having only a moderate potential for future erosion (CGS, 1982).

No data exist on historical floods for the Cheney Reservoir site. The site is at least five miles from the floodplain of the Gunnison River. Kannah Creek and Indian Creek flow at an elevation approximately 200 feet below the site. The Gunnison River flows approximately 500 feet below the site at its closest point. Therefore, the site is not subject to river flooding.

Two Road site

There are no major streams, lakes, springs, or irrigation ditches on or within two miles of the Two Road site. Several ephemeral creeks occur in the area. The site lies on a drainage divide between two unnamed ephemeral creeks. These creeks join Bitter Creek 0.5 to one mile below the site. McDonald Creek flows approximately 1.5 miles east of the site. West Salt Wash and Badger Wash combine approximately six miles southeast of the disposal area. The Colorado River flows over 10 miles south of the site.

An area of only 35 acres drains toward the site. Elevations in the watershed range from 4945 feet to 4965 feet above mean sea level. Deeply incised gullies are not present at the Two Road site, but do occur approximately 1500 feet to the east and west. Due to the narrow highland character of the site, it is subject to erosion by gulley systems advancing headward into the site from all sides; however, the surface of the site is supported by resistant pediment gravels which cap the underlying Mancos Shale. Erosion occurs along slopes where the less resistant Mancos Shale is exposed. A geomorphic analysis of the site is provided in Appendix E, Soils, Geologic, and Seismic Information.

No data on historical floods exist for the Two Road site. Due to the distance from and elevation above perennial flowing waters, river flooding would not impact the Two Road site.

Vicinity properties

The only surface-water features that occur at the vicinity properties are the small drainage systems typical of an urban setting.

Borrow sites

The 32 and C½ borrow site is located on private land along the south bank of the Colorado River east of the Grand Junction tailings site. The area is approximately 80 to 120 feet above the river surface. Four ephemeral channels drain Central Orchard Mesa in the borrow site area, two on either side of 32 Road.

The Fruita borrow site is also located adjacent to the Colorado River, south of the town of Fruita, Colorado. The area is approximately 11 miles downstream of the Colorado River and Gunnison River confluence. The site is located on private land on the northeast bank of the river. The area is drained by Little Salt Wash to the northwest and Adobe Creek to the southeast. There are a number of irrigation ditches and canals in the area.

The Unaweep Canyon borrow site is located west of the Unaweep Divide in Unaweep Canyon. West Creek flows toward the Dolores River in the vicinity of the borrow site. East of Unaweep Divide, East Creek flows toward Whitewater, Colorado, where it flows into the Gunnison River. A number of small creeks and ephemeral streams drain the upland areas adjacent to Unaweep Canyon and feed East and West Creeks.

4.6.2 Ground water

The existing ground-water environment for the processing site, alternate disposal sites, and borrow sites is discussed below. Features which are considered include hydrostratigraphy, hydraulics, water quality, and water use. The existing environment at the processing site and alternate disposal sites was defined by means of field investigations which included test borings and monitoring wells. Field investigations at the processing site and Cheney Reservoir site were completed in two phases, in 1982-1983 and 1985-1986. The investigations included 33 borings and 32 monitoring wells at the processing site, and 11 borings and five monitoring wells at the Cheney Reservoir site. Hydraulic testing, periodic water-level measurements, and repetitive water-quality sampling were completed at each site. At the Two Road site, a previous unrelated study (URS, 1983) had included two borings and two monitoring wells within or adjacent to the proposed site; an additional 16 borings and five monitoring wells were included in DOE's 1985 study. Periodic water-level measurements have been completed at the site but there has been insufficient ground water to sample.

Site-specific hydrogeologic investigations were not completed at the borrow sites, instead, conditions at the borrow sites were defined through the literature and knowledge of the general hydrogeology of the Grand Junction area (U.S. Bureau of Reclamation, 1978; U.S. Bureau of Reclamation, no date). The data and analyses supporting this discussion are presented in Appendix F, Hydrology Report.

Grand Junction site

Hydrostratigraphy and hydraulics

The shallow stratigraphy near the processing site can be divided into three hydrogeologic zones. From top to bottom these are a surficial disturbed zone altered by the action of man (this includes the tailings), a zone of unconsolidated alluvial sediments, and a sequence of consolidated sedimentary formations. Portions of the tailings and the alluvium are both within the zone of saturation and comprise part of a shallow water-table system. Saturated conditions also occur in the underlying consolidated formations. The alluvium borders the north side of the Colorado River in a strip two to three miles wide from Palisade to Loma (U.S. Bureau of Reclamation, 1978). In the vicinity of the tailings, the saturated thickness of the alluvium ranges from less than 10 feet to more than 20 feet.

The uppermost consolidated sedimentary formation is the Mancos Shale, which is generally accepted as a low-permeability formation which impedes the flow of ground water. The Mancos Shale near the tailings contains small amounts of ground water under unconfined to confined conditions. The Mancos Shale varies in thickness from greater than 100 feet near the tailings to being entirely absent about 0.5 mile west of the tailings.

Below the Mancos is the Dakota Sandstone, which, in combination with the Burro Canyon Formation, represents the uppermost potential aquifer. The Dakota Sandstone is not important as a source of water, and ranks fourth and last in importance among the four artesian aquifers in the Grand Junction area (Lohman, 1965).

There are two main components of ground-water flow within the alluvium. Near the Colorado River, the river influences the flow which is generally parallel to and in the same direction as flow in the river. Away from the river to the north, flow is more generally toward the river, reflecting the movement of irrigation return flow and canal seepage losses. The vertical hydraulic gradient between the alluvium and shallow bedrock is minimal. The Dakota Sandstone near the site is artesian but does not flow at the land surface.

A seismic risk evaluation has determined that the risk of active faulting near the processing site cannot be quantified (SHB, 1985d). In the event of active faulting there is a possibility that vertical hydraulic communication between the alluvium and the Dakota Sandstone could be increased. Additional detail on seismic risk is presented in Appendix E, Soils, Geologic, and Seismic Information.

The alluvium and the tailings are permeable enough to be classified as a good aquifer (Davis and DeWiest, 1965). The Mancos Shale and Dakota Sandstone near the site have relatively lower permeability, as determined by DOE's 1985-1986 study and other studies in the area (Lohman, 1965), and this lower permeability greatly restricts their utility as water resources.

Water quality

Background water quality for the shallow hydrostratigraphic units is brackish to salty; however, it exhibits enough variability so that some zones in the alluvium have fresh quality during at least some portion of the year. Water quality in the alluvium near the river has seasonal variability reflecting the influence of the river. Monitoring wells very near the river have seasonal concentrations of total dissolved solids (TDS) below 900 mg/l, but have seasonal maximum TDS values exceeding 2000 mg/l. Away from the river, alluvial water quality is greatly influenced by irrigation return flow. Concentrations of TDS in the alluvium or uppermost Mancos Shale exceed 10,000 mg/l in some wells. Measured background concentrations of uranium range between 6.8 and 40 pCi/l (0.01 to 0.06 mg/l -- 1 pCi/l = 0.0015 mg/l).

Background water quality in the Mancos Shale and Dakota Sandstone is also brackish. Samples from monitoring wells in both formations are typified by high concentrations of TDS, in the range of 2000 to 7000 mg/l; this is above the recommended level for drinking water (Table 4.3). This is consistent with the findings of previous studies (Lohman, 1965). The Dakota Sandstone near the site also contains some oil.

The standards for gross alpha, manganese, sulfate, and TDS are exceeded by all of the background samples. The standards for chloride and iron are exceeded by 66 percent of the background samples, and for radium and selenium, 19 and 16 percent of the samples, respectively.

Table 4.3 EPA National Drinking Water Standards (40 CFR Parts 141 and 143)

Parameter	Drinking water standards[a]	
	Primary	Secondary
Arsenic	0.05	--
Barium	1.0	--
Cadmium	0.01	--
Chromium	0.05	--
Copper	--	1.0
Fluoride	1.4-2.4[b]	--
Lead	0.05	--
Mercury	0.002	--
Nitrate	10.0	--
Selenium	0.01	--
Silver	0.05	--
Zinc	--	5.0
Chloride	--	250.0
Iron	--	0.3
Manganese	--	0.05
pH	--	6.5-8.5
Sulfate	--	250.0
TDS	--	500.0
Radium 226-228 combined (in picocuries per liter)	5.0	--
Gross alpha[c] (in picocuries per liter)	15.0	--

[a] All values in mg/l unless otherwise noted.
[b] Standard varies depending on water temperature.
[c] Does not include uranium or radon.

To determine the nature and extent of contamination in the alluvial ground water resulting from leachate generated at the Grand Junction site, upgradient, on-site, crossgradient, and downgradient concentrations were compared to background alluvial ground-water quality and all ground-water analyses were compared to the EPA primary and secondary drinking water standards. Comparisons to both the standards and the background quality is needed because the background ground-water consistently exceeded several standards.

Based on the exceedence of the standards and the exceedence of the maximum background values by alluvial ground-water samples on the site and downgradient of the site, five constituents are most critical:

- Chloride exceeded the drinking water standard in 100 percent of the on-site samples and 97 percent of the downgradient samples; it exceeded the maximum background value in 96 percent of the on-site samples and 97 percent of the downgradient samples.

- Fluoride exceeded the drinking water standard in 83 percent of the on-site samples and 25 percent of the downgradient samples, and exceeded the maximum background value in 83 percent of the on-site samples and 25 percent of the downgradient samples.

- Iron exceeded the drinking water standard in 68 percent of the on-site samples and 66 percent of the downgradient samples; it exceeded the maximum background value in 53 percent of both the on-site and downgradient samples.

- Sulfate exceeded the drinking water standard in 100 percent of on-site and downgradient samples and exceeded the maximum background value in 25 percent of the on-site samples and 15 percent of the downgradient samples.

- Cadmium exceeded the drinking water standard in 25 percent of the on-site samples and three percent of the downgradient samples; it exceeded the maximum background value in 37 percent of the on-site samples and three percent of the downgradient samples.

Other constituents whose concentrations exceeded the maximum background values in on-site and downgradient samples, but have no associated drinking water standards, include calcium, gross beta, potassium, strontium, ammonium, specific conductance, molybdenum, nickel, sodium, uranium, total halogenated hydrocarbon, and vanadium.

All of the manganese and TDS concentrations in on-site and downgradient samples exceeded the drinking water standards but only exceeded the maximum background concentration for manganese in three percent of the on-site samples and two percent of the downgradient samples. For TDS, nine percent of the on-site samples and 35 percent of the downgradient samples exceeded the maximum background concentration.

Although radium and gross alpha are shown to exceed the Title II uranium mill tailings standard, these values are not appropriate. Radium is considered to exceed the standard for analyses with detection limits over five pCi/l. Many of the recorded exceedences are less than six pCi/l. These samples may be within compliance of the standard. The gross alpha measurements included uranium and radon whereas the standard excludes these two constituents. Excluding uranium activity from the gross alpha count would reduce the measurements to less than the standard for most of the samples. Supporting data and additional analysis and discussion are included in Section F.3.1.

Water use

Known use of shallow ground water in the area of the site is minimal. This may be attributed to the availability of a good quality municipal water supply. One 40-foot-deep industrial well taps the alluvium and Mancos Shale less than 1000 feet east and upgradient of the tailings. The well is used for drainage of low-lying land during periods of high water in the adjacent Colorado River. Only two other registered wells penetrate the recent Colorado River alluvium within six miles of the Grand Junction pile. Both wells are flowing wells completed in the Dakota Sandstone. Only one is north of the river, approximately 1.5 miles west of the site. The other well, south of the river, is beyond the potential impacts from the site. Utilization of the Dakota in the Grand Junction area is minor because of the generally poor quality and low yield of the formation, which is rated fourth and last among the artesian aquifers in the Grand Junction area. Because of the poor quality and low yield of the Dakota Sandstone, very little additional development of water from these formations is likely (Lohman, 1965).

Cheney Reservoir site

The stratigraphy at the Cheney Reservoir site consists of between 23.5 and 42 feet of unconsolidated deposits overlying several hundred feet of Mancos Shale. Ground water is found in the lower few feet of the unconsolidated deposits but not in the upper Mancos Shale. Local ground-water flow generally parallels the local slope of the land surface to the west. The portion of the unconsolidated deposits below the water table has a relatively low permeability when compared to alluvial deposits near the processing site. Because of the low permeability and thinness of the saturated layer, a well completed in it would probably yield less than three gallons per day.

The local ground-water system is probably recharged by seepage from a ditch which is approximately 0.5 mile east of the site. The ditch diverts water from Indian Creek, an intermittent drainage fed by snowmelt on the Grand Mesa. Discharge of the local ground-water system is not readily apparent, but may occur as evapotranspiration or as underflow to an ephemeral reach of Indian Creek southwest of the site.

Water quality of the shallow ground water ranges from good to poor, exhibiting a definite decrease in quality related to distance from the recharge source. Based on measurements of electrical conductivity, it is believed that concentrations of TDS in the water in the ditch are less than 250 mg/l. The farthest upgradient well has concentrations of TDS ranging between 650 and 1000 mg/l. This upgradient well is approximately 2400 feet from the recharge source. A downgradient well approximately 3300 feet from the ditch or recharge source had a measured TDS concentration of 3746 mg/l, although it was not certain that the TDS concentration was representative of ground-water quality.

There is no known existing use of ground water in the immediate vicinity of the site. The closest known registered wells are about two miles away from the site along Kannah Creek.

Two Road site

The stratigraphy at the Two Road site consists of a less than 15-foot to more than 30-foot-thick layer of unconsolidated deposits overlying approximately 500 to 1400 feet of Mancos Shale. No ground water was encountered during the 1985 field program. Ground water occurs intermittently below a nearby stock pond which is approximately 1000 feet east of the site (URS, 1983). There probably is ground water in the alluvium underlying washes on either side of the site. The water quality in these washes is poor based on reports for a well about four miles southwest of the site (State of Utah, 1938). There is no known use of ground water within four miles of the site.

Vicinity properties

No ground water would be impacted by remedial action at vicinity properties; therefore, the ground-water regime beneath the city of Grand Junction was not characterized for this EIS.

Borrow sites

All of the borrow sites except the Unaweep Canyon borrow site lie adjacent to the Colorado River and are within the Grand Valley. They are within unconsolidated alluvium overlying Mancos Shale. Ground-water flow within the alluvium has two components: flow influenced by and parallel to the river, and irrigation return flow toward the river. Water quality near the river can be fair; however, shallow ground water typically has a brackish quality characterized by high concentrations of dissolved solids. There is little use of shallow ground water in the Grand Valley. No ground water is expected to be present within the area that would be disturbed at the Unaweep borrow site.

4.7 ECOSYSTEMS

4.7.1 Introduction

An overview of the vegetation, wildlife, and aquatic components of the Grand Junction site, alternate disposal sites, and borrow areas is presented in this section. Data used herein were derived from field studies conducted by Biota (1985a,b), URS (1983), and reconnaissance level surveys conducted by the NUS Corporation (DOE, 1983a) and DOE in 1985. Additional information was obtained from Federal and state agency personnel and pertinent literature.

Appendix H, Biologic Information, contains lists of wildlife and plant species that are characteristic of or have been observed at the Grand Junction site, the alternate disposal sites, and borrow sites. Scientific names of species referred to in the text appear in Appendix H.

4.7.2 Vegetation

The Grand Junction area is located in the western shrub and grassland habitat of the Colorado Plateau (Kuchler, 1964). The dominant regional plant community in which the study areas are located is the saltbush-greasewood type surrounded by pinyon-juniper woodland.

Grand Junction site

The Grand Junction site consists of 114 acres of highly disturbed land. Past efforts to restore vegetation to this area have been largely unsuccessful (DOE, 1983a). The vegetative cover is sparse and is dominated by early successional species such as crested wheatgrass, kochia, and Russian thistle.

A drainage ditch occurs at the east end of the site and tamarisk, wheatgrass, Great Basin wildrye, thistle, and some cattail occur here.

A zone of riparian vegetation occurs in the Colorado River adjacent to the tailings pile (COE, 1985) (Figure G.3.1, Appendix G, Floodplain and Wetlands Assessment). Using Cowardin et al.'s (1979) wetlands classification, the area is comprised of palustrine scrub-shrub, palustrine forest, and unconsolidated habitats (USFWS, 1985). The palustrine scrub-shrub type is dominated by tamarisk and willow, and various grasses and herbs are also common. The palustrine forest habitat is dominated by cottonwood with understory vegetation similar to that observed in the palustrine scrub-shrub type. The unconsolidated habitat consists of mudflats and rocky shores. Additional details regarding this area appear in Appendix G.

Cheney Reservoir site

The plant species at the Cheney Reservoir site are characteristic of a salt desert community, with an abundance of greasewood. Shrub density is estimated to be 268 per square meter with shadscale being the most abundant (43 percent) followed by bud sagebrush (31 percent) and greasewood (27 percent). Other common species are galleta grass, Indian ricegrass, squirrelgrass, and prickly pear. Ground cover is estimated to be 14 percent (DOE, 1983a).

Two Road site

The two major cover types within the Two Road site are grassland and saltbush. The grasslands cover the north and west part of the site. Cheatgrass is dominant with the composite galleta grass, scarlet globemallow, and prickly pear cactus also common. The saltbush type covers the remainder of the site; shadscale is dominant with Nuttail's saltbush, cheatgrass, scarlet globemallow, rabbitbrush, and prickly pear as subdominants (URS, 1983).

Vicinity properties

Vicinity properties are mostly residential lots and some commercial and vacant lots. The vegetation is composed primarily of landscape vegetation or invading successional plant species.

Borrow sites

The 32 and C½ borrow site is a series of active borrow pits located on the south side of the Colorado River. The borrow site is extensively disturbed and contains little vegetation. The principal plant communities in the area are orchards, pasture, and small wood lots. Small streams also occur in the area.

The Fruita borrow site is a group of privately owned existing gravel pits on the north side of the Colorado River. It is essentially devoid of vegetation and is next to alfalfa and Timothy hay fields on the north, east, and west sides. A few cottonwoods grow along the river next to the site and widely scattered successional weedy plants are found on the site.

The Unaweep Canyon borrow site is dominated by stony land on steep slopes with deposits of cobbles, boulders, and stones that are 10 to 200 feet thick (SCS, 1978). The vegetation consists of pinyon pine, Rocky Mountain juniper, scattered ponderosa pine, grasses, annuals, and cactus.

The Unaweep Seep Research Natural Area and Watershed (BLM, 1985a) is located within the vicinity of the borrow site. The seep is a wooded wetland with cottonwood and willow being the common woody species. Carex species, cattail, grass, and various other herbaceous plants form a dense ground cover.

4.7.3 Wildlife

Grand Junction site

The Grand Junction tailings site has low mammal diversity due to the disturbed nature of the habitat and close proximity to the city of Grand Junction. The most common species is the prairie dog with 773 burrows counted in 1985 (Biota, 1985a). The desert cottontail was the only other mammal species observed. Bird use of the sparsely vegetated tailings is limited; the meadowlark and magpie are the most common species. Reptiles at the site include the gopher snake and plateau whiptail lizard; few other species are expected on the tailings pile.

Riparian zone

Limited field surveys within the riparian zone indicated that habitat for amphibians and reptiles such as the bullfrog, leopard frog, and wandering garter snake occur in this area. Bird use of this area is fairly extensive. The yellow warbler and song sparrow are the most common nesting species. Mallards and the black-crowned night heron occur at the site. Other common species are the western kingbird, magpie, and swallows of various species. Numerous shorebird, wading bird, and waterfowl tracks also occur. Mammal activity in this area is expected to be substantial; raccoon and skunk tracks have been observed along with beaver and muskrat sign.

Aquatic biota

The Colorado River in the area of the Grand Junction site meanders through agricultural-residential areas and is braided around gravel islands. The river has large annual fluctuations in flow, temperature, and turbidity.

The aquatic biota of the Colorado River at Grand Junction was surveyed by Valdez et al. (1982), in a 31-mile stretch from Palisade to Loma, Colorado. The bluehead sucker, flannelmouth sucker, common carp, roundtail chub, red shiner, sand shiner, and fathead minnow were found to be common. Game species include the green sunfish, bluegill, largemouth bass, black crappie, black bullhead, and channel catfish.

Cheney Reservoir site

Mammals occurring at the Cheney Reservoir site include the desert cottontail, white-tailed antelope squirrel, deer mouse, and pronghorned antelope. Furbearers harvested from the area include the coyote, bobcat, badger, striped skunk, and spotted skunk (DOE, 1983a).

The diversity of bird species at the Cheney Reservoir site is low due to the limited variety of vegetation. Common nesting species include the horned lark and meadowlark. The golden eagle, prairie falcon, and kestrel have been observed hunting at the site. The only nesting bird of prey recorded on the site was the burrowing owl.

Reptiles which occur at the site include the short-horned lizard, sagebrush lizard, and gopher snake. Amphibians are not expected to occur on this site due to the lack of permanent water or temporary ponding.

Small game species present at the site include the desert cottontail, mourning dove, and Gambel's quail. The pronghorn antelope is the only big game species that has been observed at the site; the size of the herd is estimated to be approximately 60 individuals (Morris, 1986). The mule deer may occur as an occasional visitor.

Two Road site

Data regarding mammal species were collected through trapping, nighttime spotlighting, aerial surveys, and general reconnaissance (URS, 1983). A total of 11 species were observed with the deer mouse and pinyon mouse being the most abundant small mammal species collected during 1800 trap nights. The prairie dog is a common species with 12,975 burrow openings observed at the site plus a 0.5-mile buffer zone (Biota, 1985a). The estimated prairie dog density is four to six animals per acre. Other mammals include the desert cottontail, white-tailed and black-tailed jackrabbit, coyote, badger, and pronghorned antelope. About 30 pronghorn reside year-around and 20 mule deer winter in the vicinity of the site. Critical winter range does not occur at the site (URS, 1983).

Reptiles which occur at the site include the short-horned lizard and leopard lizard. Amphibians are not expected at the site due to the lack of permanent or even temporary surface water needed for breeding.

A total of 26 species of birds were observed at the site. The horned lark, western meadowlark, and lark sparrow are the most common nesting species. Other nesting species are the Brewer's sparrow, mourning dove, sharp-tailed grouse, and common nighthawk. Burrowing owls are the only nesting raptor on the site. The golden eagles, prairie falcon, northern harrier, Cooper's hawk, ferruginous hawk, and rough-legged hawks occur near the site. Most of these raptors use the area as hunting habitat. The Swanson's hawk and ferruginous hawk nest nearby (Lockhart, 1985).

Vicinity properties

Wildlife would consist of small animals such as nocturnal rodents, common songbirds, and lizards associated with each property's micro-environment.

Borrow sites

The 32 and C½ and Fruita borrow sites are highly disturbed and consequently few wildlife species occur in the area. Songbirds, rodents, and herptiles occur along the edges while waterfowl and shore birds may rest and feed along the Colorado River adjacent to the site.

Data regarding wildlife near the Unaweep Canyon borrow site area were obtained from BLM (1985a,b). This section of the Canyon is designated as critical winter range for both elk and mule deer. There are known golden eagle nests in the area as well as redtail hawk, and Cooper's hawk nests. Potential nest sites for the peregrine falcon occur in the Canyon and bald eagles are known to winter along the creek.

4.7.4 Threatened or endangered species

A total of 31 species of plants and wildlife are listed as threatened or endangered within Colorado by the Federal and state governments (USFWS, 1983; Colorado Division of Wildlife, 1983). Ten of those species have been recorded in Mesa County in recent years (DOE, 1983a) and this discussion will focus on these species.

Spineless hedgehog cactus is an endangered species and may occur at the Cheney Reservoir site (USFWS, 1983) and does occur in Unaweep Canyon (BLM, 1985b). This species is most frequently encountered in duff that accumulates under pinyon pines; it is less commonly observed in sagebrush (USFWS, 1978). The Cheney Reservoir site supports a desert shrub community, and appropriate habitat for this species does not occur on the site. BLM personnel indicate its occurrence at this site is highly unlikely (DOE, 1983b). The appropriate habitat for this species occurs in Unaweep Canyon and the occurrence of this species in the borrow site area is possible.

Uinta Basin hookless cactus is a threatened species and may occur at the Cheney Reservoir site (USFWS, 1983). It is found in a variety of habitats, although habitat descriptions agree that soils supporting this species are gravelly or rocky (USFWS, 1978; Colorado Natural Areas Program, 1982). Associated plants are shadscale, galleta grass, and Mormon tea. Populations of the Uinta Basin hookless cactus are known to exist west of the Cheney Reservoir site on rims above the Gunnison River; however, none are known near the Cheney Reservoir site (DOE, 1983a).

The butterfly, Nokomis Fritillary (Speyeria nokomis nokomis) was previously proposed for listing as an endangered species but is no longer under consideration. The butterfly occurs at only one location in Unaweep Canyon, at a spring on the western end of the canyon. This butterfly is not known to occur outside of the 50-acre location (McVean, 1986).

The Colorado squawfish is an endangered species that occurs in the Colorado River near the Grand Junction site (USFWS, 1983, 1984). Valdez et al. (1982) and Archer et al. (1985) studied the ecology of the Colorado squawfish in the Colorado River. Relative to the Grand Junction area, they found that young-of-the-year and juvenile squawfish are found 30 or more miles downstream while adults were captured nearby at Clifton Pond and Walter Walker Wildlife Area. Adults are thought to use the section of river from Moab, Utah, to Grand Junction for spawning including the Walter Walker Wildlife Area. This species will congregate in deep pools during the winter and disperse to backwaters, side channels, slow moving shoreline areas, and irrigation returns to avoid high-flow areas during spring runoff.

The humpback chub is an endangered species and may inhabit the Colorado River near the Grand Junction site (USFWS, 1983, 1984). The only concentrations of the humpback chub in the upper Colorado River are in deepwater canyons at Westwater Canyon and Black Rocks about 30 miles downstream from the Grand Junction site (Archer et al., 1985; Valdez et al., 1982). No specimens have been taken near Grand Junction. The occurrence of this species is correlated with deep, swift reaches of the river and its occurrence in the river near the tailings pile would be very sporadic.

The razorback sucker is listed as endangered by the State of Colorado (Colorado Division of Wildlife, 1983) and according to the USFWS (1983) may inhabit the Colorado River near the Grand Junction site. A total of 37 of 52 razorback suckers captured by Valdez et al. (1982) were from inundated gravel pits along the river near Grand Junction at Clifton Pond and Walter Walker Wildlife Area. It is also known from the Gunnison River at its confluence with the Colorado River (Colorado Division of Wildlife, 1978). Habitat preference is for slow-moving water (gravel pits or backwaters) over silt. It is likely that this species occurs, at least occasionally, in the slower moving side channels of the Colorado River near the tailings pile.

The bonytail chub is endangered in Colorado and "... is the rarest of the Colorado River native fishes..." (Behnke and Benson, 1983). This species was not captured in the Colorado River by Valdez et al. (1982) and the only recent captures were in the Green River in Utah (Behnke and Benson, 1983) and the Colorado River at Black Rocks near the Colorado-Utah border (Kaeding, 1985). Given that this species is almost extinct in the Colorado River, its occurrence near Grand Junction is highly unlikely.

The whooping crane is an endangered species and according to the USFWS (1983) may potentially occur near the Cheney Reservoir site. Whooping cranes that were reared by sandhill cranes in Idaho migrate through western Colorado (Colorado Division of Wildlife, 1978). Migrating cranes from this population have been observed at various reservoirs in the Grand Valley (DOE, 1983b). Cheney Reservoir occurs in this area and, as such, may also serve as a stopover point for migrating whooping cranes. Whooping cranes would be expected to forage at the reservoir and surrounding uplands and roost at the reservoir at night.

The bald eagle nests and winters in Colorado. In 1983 this species nested at four locations in Colorado, none of which were near Grand Junction (DOE, 1983b). Concentrations of up to 500 birds occur during the winter in Colorado. This species may occur along the Colorado River near the tailings (USFWS, 1983) and winters in small numbers in the Unaweep Canyon (BLM, 1985a). The Grand Junction site is not within a wintering eagle high use area though occasional eagles are observed near Grand Junction during the winter (DOE, 1983a).

The peregrine falcon is an endangered species and may occur near the Two Road site (USFWS, 1984) and in Unaweep Canyon (BLM, 1985a). Appropriate nesting habitat (cliffs near water) does not occur at or near the Two Road site. The peregrine may use this area as hunting habitat during migration.

The black-footed ferret is an endangered species and according to the USFWS (1983, 1984) may occur at the Cheney Reservoir and Two Road sites. There are no recent specimen records of the black-footed ferret for Colorado, although occasional sight records are reported from several areas of the state. The species is closely associated with prairie dogs in that prairie dogs are their major prey base and they use prairie dog burrows for shelter and as den sites. Ferrets are primarily nocturnal and spend most of the time underground, except for dispersal of young in September and October (Hillman and Clark, 1980).

The Two Road site and surrounding area contain a few thousand acres of prairie dogs which could support a ferret population. However, intensive nocturnal and diurnal study of the area indicates that this species did not occur in 1985 at the Two Road site (Biota, 1985a,b).

The Cheney Reservoir site has a small population of prairie dogs along its northeastern boundary. Other prairie dog towns occur in the area; the closest town to the site is about one mile away (DOE, 1983b). Black-footed ferrets have not been observed in the Cheney Reservoir area.

4.8 RADIATION

The radiological environment at and near the Grand Junction site, the Two Road site, and the Cheney Reservoir site is summarized in this section. The radiological units of measure are picocuries (pCi) or microcuries (uCi) per liter (l) or gram (g). Radiological dose rates and exposure are presented in microroentgens per hour (uR/hr) and millirem per year. For purposes of this EIS, the roentgen and rem may be considered equivalent for gamma radiations.

The radiation environments at the Grand Junction site and the two alternate disposal sites were determined from the literature and from field monitoring programs. A more extensive discussion of the radiation environment and radiological matters in general is provided in Appendix I, Radiation Health Effects.

The elevated levels of radiation reported in the following sections and in Appendix I should be compared to the levels of natural background radiation and other anthropogenic radiation levels for perspective. Natural radioactive materials in the earth's crust (primarily uranium, thorium, radium, and potassium) and cosmic rays from outer space continually expose people to a radiation flux. Additionally, people are routinely exposed to man-made sources of radiation which include medical exposures, fallout from weapons testing, and consumer products. On the average, a person in the United States receives a dose equivalent of 200 millirem per year. Approximately 45 percent of this dose equivalent comes from medical exposures such as X-rays, 50 percent comes from natural radiation sources, and five percent results from the other exposure categories (Shleien and Terpilak, 1984). Some activities, occupations, and areas of the country expose a person to a greater-than-average radiation dose equivalent. A person employed in a nuclear power plant receives, on the average, 400 millirem per year (EPA, 1984). A person living at high altitudes such as Albuquerque, New Mexico (elevation 5000 feet), receives nearly twice as much cosmic radiation as a person living at sea level.

4.8.1 Grand Junction

The environmental radiological levels for the area surrounding the Grand Junction site have been characterized in previous studies (EPA, 1975; FBDU, 1981; ORNL, 1980; MSRD, 1982; BFEC, 1985).

Short-term radioactive airborne particulate concentrations were measured by Oak Ridge National Laboratory (ORNL) on the State of Colorado tailings repository, adjacent to the tailings pile at the Grand Junction site. The concentration of radioactive particulates from these 3.2-hour samples taken with a high-volume air sampler ranged from 1.4 to 17 pCi/m^3 Ra-226, 4.4 to 11 pCi/m^3 Pb-210, 3.8 to 14 pCi/m^3 Th-230, and 2.1 to 4.2 pCi/m^3 U-238 (ORNL, 1980).

Several studies to determine ambient air radon concentrations near the Grand Junction site have been undertaken (FBDU, 1981; Schearer and Sills, 1969; EPA, 1977). On-pile measurements yielded an annual-average radon concentration of 26 pCi/l (FBDU, 1981). The results of 24-hour average radon concentrations ranged from 6.7 pCi/l at 0.08 mile from the pile to 2.6 pCi/l at 0.33 mile from the pile (FBDU, 1981). The average background radon concentration, determined from year-long measurements taken in 1969 (Shearer and Sills) and from 1974 through 1975 (EPA), is 0.8 pCi/l. These measurements were obtained approximately 1.7 miles from the pile.

Gamma radiation levels have been measured and found to decrease rapidly with distance from the tailings pile. On the pile, gamma radiation levels vary from 150 to 350 uR/hr (ORNL, 1980). A background level of 11 uR/hr is reached at approximately 0.3 to 0.4 mile from the pile in each direction. The range of typical background values is seven to 17 uR/hr (ORNL, 1980).

Background concentrations of radionuclides in soils have been measured in and around Grand Junction by a number of investigators. Results are generally comparable and are typified by the ORNL, 1980, results which indicate the following average concentrations: Ra-226, 2.0 pCi/g; U-238, 0.7 pCi/g; and Th-232, 0.6 pCi/g. Within the designated site boundary in off-pile areas, the range of Ra-226 concentrations is two to 7589 pCi/g (BFEC, 1985). The highest Ra-226 concentrations occur in the former ore storage area and mill yard. The former settling ponds and the State of Colorado tailings repository have lower levels of contamination. Figure 4.11 shows the extent and depth of contamination around the Grand Junction site.

On the pile, a statistically designed sampling program conducted by Mountain States Research and Development (MSRD, 1982) resulted in pile-average values of 54 pCi/g U-238, 702 pCi/g Ra-226, and 702 pCi/g Th-230. Radium concentrations ranged from 35 to 3129 pCi/l within the tailings pile. The latter two radionuclides were measured in the MSRD samples by Bendix Field Engineering Corp. (BFEC, 1985).

Sediment samples taken at the edge of the Colorado River within 100 yards of the tailings pile had a range of Ra-226 concentrations of 1.4 to 9.5 pCi/g (ORNL, 1980). The highest concentration of Ra-226 found in a sediment sample was 68 pCi/g. This sample was from a drainage ditch at the southeast corner of the tailings pile (ORNL, 1980).

A surface-water sampling program was conducted from 1961 to 1972. During this period, the average concentration of Ra-226 in the Colorado River upstream of the tailings pile was 0.18 pCi/l. Downstream from the pile the concentration of Ra-226 was 0.16 pCi/l (FBDU, 1981). In a more recent study conducted by ORNL, one upstream sample in the Colorado River had radionuclide concentrations of 0.51 pCi/l Ra-226, 21 pCi/l Th-230, and a nondetectable concentration of Pb-210. The single downstream sample resulted in a concentration of 0.06 pCi/l Ra-226 and nondetectable levels of Th-230 and Pb-210 (ORNL, 1980).

Upgradient ground-water samples had nondetectable concentrations of Ra-226 and a total uranium content of 6.8 pCi/l. The highest measured Ra-226 concentration in ground water was 29 pCi/l underneath the tailings pile (see Appendix F, Hydrology Report).

4.8.2 Cheney Reservoir and Two Road sites

Radiation levels currently existing at the Cheney Reservoir and Two Road sites have been determined from monitoring programs conducted by the DOE. The data described below are the result of three months of monitoring (April through June, 1985).

Using the Track-Etch method, DOE measured ambient air concentrations of Rn-222 at one location at each site for three months. The average Rn-222 concentration at the Cheney Reservoir site was 0.47 pCi/l. The average Rn-222 concentration at Two Road was 0.46 pCi/l.

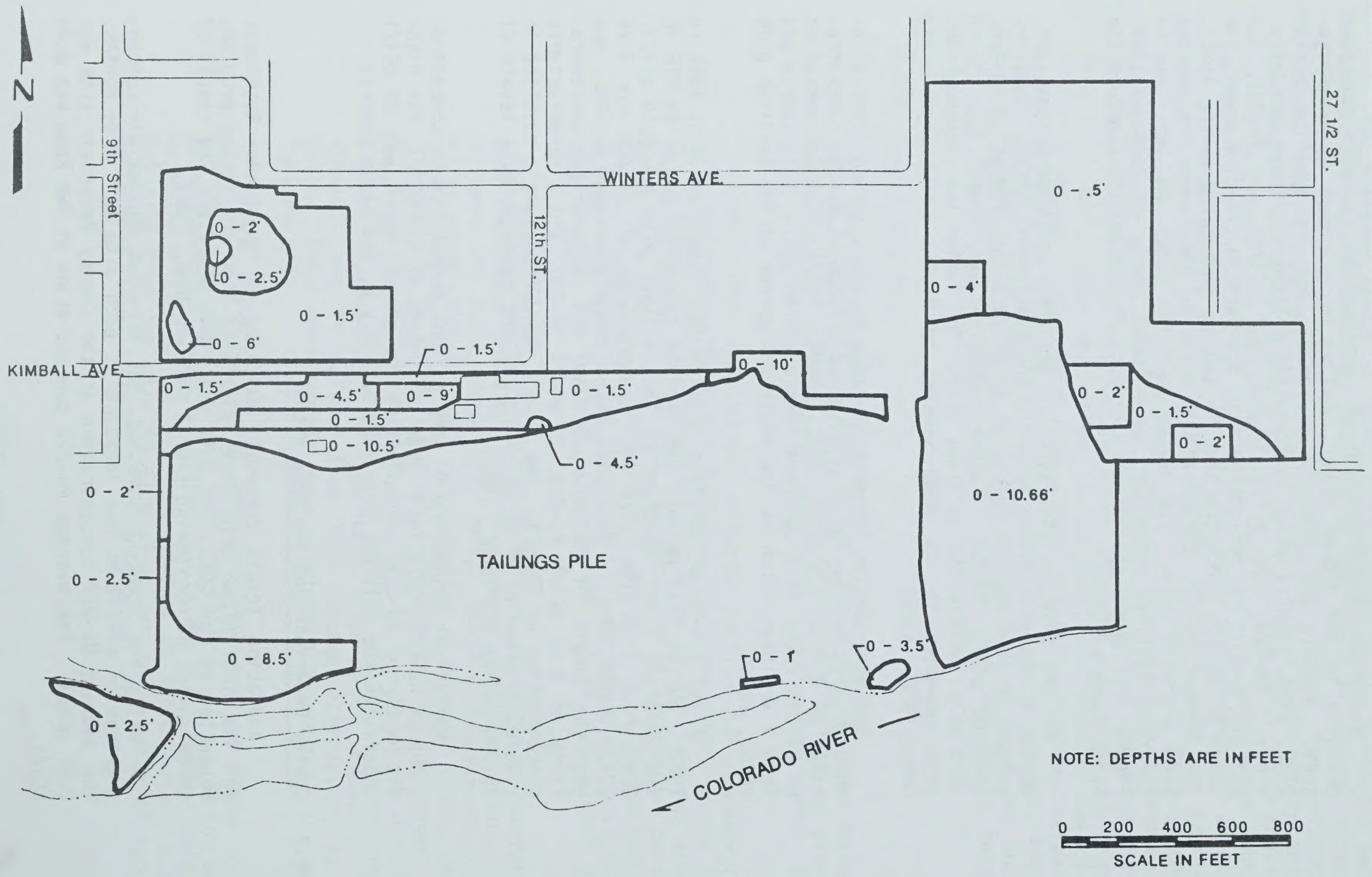


FIGURE 4.11
OFF-PILE, ON SITE DEPTH OF CONTAMINATION
GRAND JUNCTION SITE

A general survey of terrestrial and cosmic radiation levels was also conducted by the DOE in the area surrounding each alternate disposal site. The measurements were performed by taking four pressurized ionization chamber measurements at each site. The average of the measurements was 13.8 uR/hr at the Cheney Reservoir site and 13.6 uR/hr at the Two Road site.

Five surface soil samples (to a depth of six inches) were taken at Two Road and four soil samples were taken at Cheney Reservoir. The surface soil samples taken at Two Road had an average Ra-226 concentration of 0.94 pCi/g with a standard deviation of 0.17 pCi/g. The samples taken at the Cheney Reservoir site had a Ra-226 concentration of 1.8 pCi/g with a standard deviation of 0.73 pCi/g.

4.8.3 Borrow sites

The radiation environment at the potential borrow sites has not been characterized. The naturally occurring radiation levels at these sites are expected to be similar to the levels found at the alternate disposal sites.

4.8.4 Vicinity properties

An estimated 300,000 cubic yards of uranium tailings have been moved from the Grand Junction site and used as fill material on various construction projects. Approximately 3465 vicinity properties would be cleaned up during the remedial action at the Grand Junction site.

The highest annual average radon working level found indoors at a vicinity property was 1.5. The average value found in properties with structural contamination was 0.018 working level. The average of the high indoor gamma exposure rate is approximately 29 uR/hr. The average of the high outdoor gamma exposure rate is 74 uR/hr.

4.9 LAND USE

4.9.1 Regional setting

Grand Junction, the county seat of Mesa County, is the commercial, agricultural, and transportation center of western Colorado. The county has gradually shifted from an economy based on agriculture to one based on construction, manufacturing, and energy development, as well as agriculture. Although most of the land in Mesa County is used as rangeland, the county is a commercial center for the region. Grand Junction contains more than one-third of the county's population.

Table 4.4 presents the results of a 1982 zoning survey. According to the survey, Mesa County contained a total of 2,133,000 acres. Of the total county acreage, 71.50 percent was

Table 4.4 Mesa County/City of Grand Junction zoning survey December, 1982

Zoning designation	Acres	Percentage[a]
Residential	26,747.8	1.25
Commercial	4,148.2	0.20
Industrial	4,206.1	0.20
Agriculture, forestry, and transition (private)	520,163.7	24.38
Agriculture, forestry, and transition (U.S. Government)	1,525,933	71.50
Other (state government)	5,209.7	0.25
Total zoned area in Mesa County	2,086,408.5	97.78
Incorporated cities and towns	10,988.4	0.53
Unclassified areas (e.g. roads, rivers, canals)	35,603	1.68
Total area in Mesa County	2,133,000	100.0
Grand Junction	8,157	100.0
Residential	3,677	(43.9)
Commercial	3,622	(43.3)
Industrial	754	(9.0)
Unzoned	104	(1.2)
Total zonable area in Grand Junction	8,157	97.4
Rivers, canals, lakes, and roads	216	(2.6)
Total area in Grand Junction	8,373	100.0

[a]Percentages in parentheses represent proportions of the total acreage in the city of Grand Junction zoned as designated.

Ref. City/County Comprehensive Planning Department, 1983.

owned by the Federal Government, 0.25 percent was owned by the state government, 26.03 percent was privately owned land outside of incorporated cities and towns, and the remaining 2.22 percent represents private and publicly owned land inside incorporated cities and towns, and land in unclassified areas such as roads, rivers, and canals (City/County Comprehensive Planning, 1983).

The 1982 survey placed the majority of the land in Mesa County (96.88 percent) in the agriculture, forestry, and transition zoning classification. The Federally owned acreage (1,525,933 acres) in this classification was managed by the U.S. Forest Service (545,679 acres), BLM (958,094 acres), National Parks Service (19,406 acres), and Bureau of Reclamation (2754 acres). Mesa County residential acreage included 26,748 acres, or 1.25 percent of the total county acreage. County commercially zoned acreage included 4148 acres, or 0.20 percent of the total Mesa County acreage. Acreage zoned for industrial use included 4206 acres, or 0.20 percent of the total of the Mesa County acreage (City/County Comprehensive Planning, 1983).

In 1978, Mesa County contained a total of 1257 farms. Land in farms (482,856 acres) represented 22.6 percent of the county's total area. The average farm size was 384 acres. Of the 482,856 acres in farms, 100,378 acres were used as cropland, 16,502 acres were woodland, and 365,956 acres were used for other purposes. A total of 103,540 acres were irrigated (City/County Comprehensive Planning, 1983).

In 1981, the value of Mesa County crop production totalled $23.0 million. Major crops include hay, corn grain, corn silage, barley, fruits, and vegetables. The number of irrigated acres increased 23.8 percent between 1974 and 1978. Despite the economic diversification in Mesa County during the past decade, agriculture is expected to continue to be a major component of the Mesa County economic base (City/County Comprehensive Planning, 1983).

Within the city of Grand Junction, the 1982 survey showed 43.9 percent of the city's 8373 acres were zoned for residential use, 43.3 percent were zoned for commercial use, and nine percent were zoned for industrial use. Rivers, canals, and roads covered 216 acres, or 2.6 percent of the city's land. The remaining 1.2 percent of the land in Grand Junction was unzoned (City/County Comprehensive Planning, 1983).

4.9.2 Grand Junction site

The Grand Junction tailings site is privately owned and is located in a primarily urbanized area, with residential, commercial, and industrial development nearby. The land within 0.5 mile of the site on the north side of the river is undergoing a transition from residential to commercial and industrial uses. Residences are being replaced with business establishments to the northeast and west of the site. The area's proximity to the Denver and Rio

Grande Western Railroad makes it desirable for industrial development. Commercial and industrial land use occurs immediately north and northeast of the tailings site (Figure 4.12). There is some residential development south of the site, across the Colorado River. The residential area west of the site is an older low-income area, with many old houses interspersed with some commercial establishments. The land east of the site is used for industrial purposes or is vacant. The vacant lands mark the transition between the urban area of the city and the rural residential and agricultural areas east of the city. The railroad is roughly the northern boundary of the area of industrial land use. There is an industrial park near the north side of the site. As this is developed, it is expected to hasten the industrialization of the other land in the vicinity of the site (DOE, 1983a).

The site is outside the incorporated area of the city of Grand Junction and is therefore not subject to the zoning restrictions of the city. The area is, however, subject to county zoning; the site and the surrounding area are zoned industrial. The industrial classification extends out as far as 28 Road (Figure 4.12), where it changes to the agricultural-forest-transition classification. This designation is reserved for areas that are undergoing a transition from agricultural or forest land to industrial use. The area immediately adjacent to the northwest portion of the site is part of Grand Junction; it is zoned I-2 which is heavy industrial. The site is surrounded by land zoned industrial (DOE, 1983a).

Since the site is outside the city limits, it is controlled by Mesa County's Land Use Plan and development policies. The latest addition to the plan and development policies occurred in September, 1982. The part of this document that is pertinent to the development of the site and its vicinity is Section 9, which includes land-use and site-planning standards. This section recommends the use of planned-unit developments to ensure that all new construction is in conformity with the character of the area. The county encourages developers to draw up their own plan and site-planning criteria, which are then subject to gross density limits, performance standards, and a requirement for buffer zones between substantially different types of development (DOE, 1983a).

Grand Junction's adopted parks and recreation plan designates the tailings site as part of the proposed Colorado River Park System. However, as previously noted, the site is not currently within the city limits. Thus, there is an apparent conflict between the commercial/industrial zoning and land use designation of the site, as well as the adjacent property, and its designation as part of the Colorado River Park System (City Planning Department, 1984). The site is located in a 100-year floodplain. City regulations require that a Flood Development Permit be obtained before developments in the floodplain may commence and the county discourages development in the floodplain (City Planning Department, 1984).

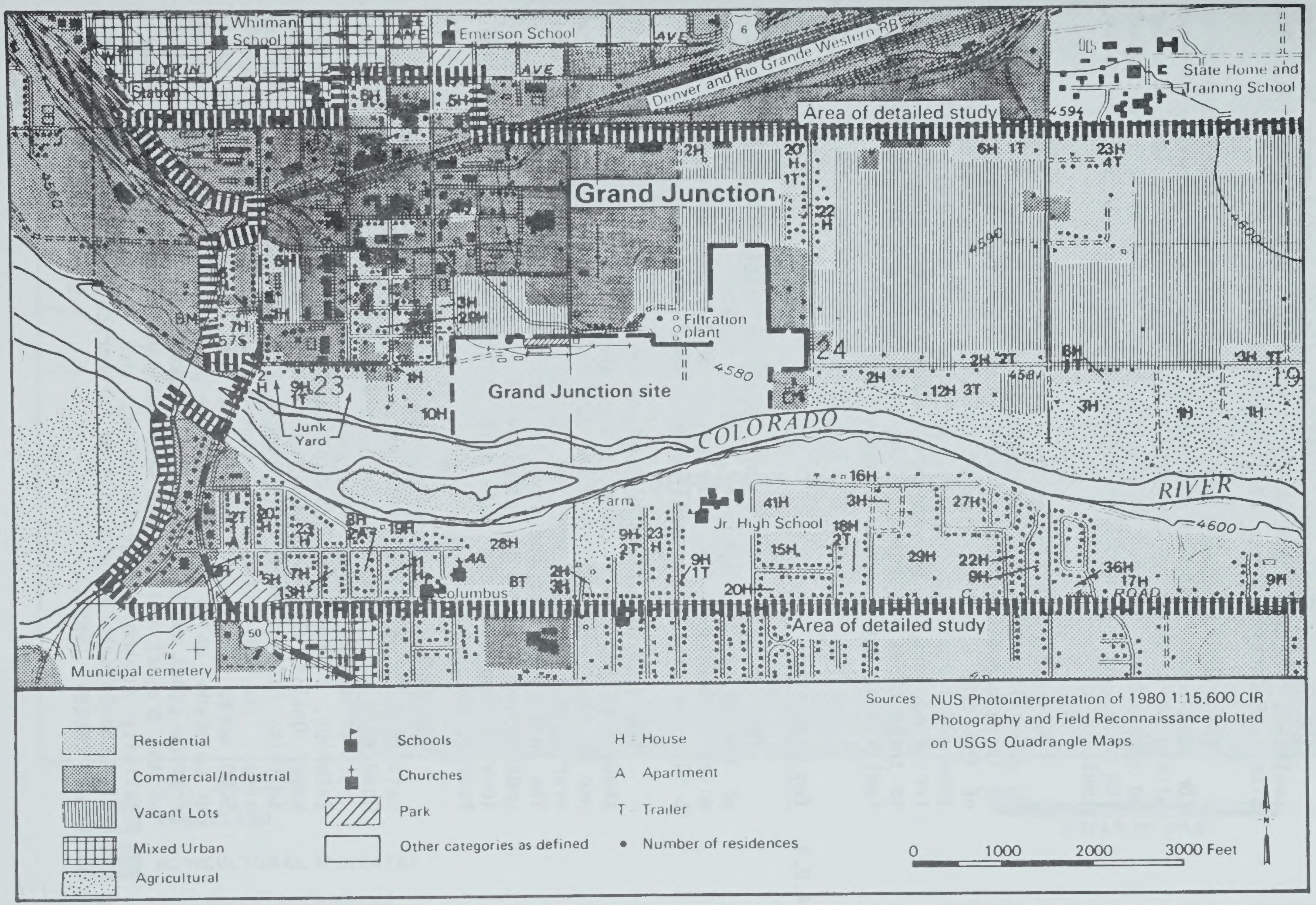


FIGURE 4.12

LAND USE AT THE GRAND JUNCTION SITE

4.9.3 Cheney Reservoir site

The Cheney Reservoir site is located approximately 18 miles southeast of the Grand Junction site off U.S. Highway 50. The site is Federally owned, and is managed by the BLM.

The site is located within a BLM grazing allotment designated for cattle. Grazing on the rangeland is the primary use of land within three miles of the site. The site, however, is also under an oil and gas lease. An electric power transmission line crosses the site, and another line occurs east of the site (Logan-Pearce, 1985).

The nearest residences to the site are two mobile homes located approximately 1.5 miles to the northeast (Figure 4.13). A zone of irrigated agricultural land begins about two miles to the north of the site in the valley of Kannah Creek. Associated with this zone are farmsteads, ranches, and some mobile homes. Most of the irrigated land is two to three miles from the site. Between two to three miles northeast of the site there are at least 11 single family homes and two mobile homes (DOE, 1983a).

4.9.4 Two Road site

The Two Road site is located approximately 33 miles northwest of the Grand Junction site. It is located along Two Road, 3.4 miles northwest of the intersection of Two Road and U.S. Highway 6 & 50. The site is Federally owned, and is managed by the BLM.

The site is within a BLM grazing allotment. The grazing of sheep on the area's sparsely vegetated rangeland is the primary use of the land. Deer are the dominant wild grazing animals; however, their numbers are few in the region containing the site. The land containing the site is also under oil and gas leases; an underground natural gas pipeline (running northwest-southeast) is located approximately one mile northeast of the site (Logan-Pearce, 1985).

The proposed Glenwood-Dotsero project, designed to reduce the salt content of the Colorado River, considers the area of the Two Road site as a potential location for evaporation ponds. The project is under the jurisdiction of the U.S. Department of the Interior, Bureau of Reclamation, and is part of the Colorado River Water Quality Improvement Program. The Glenwood-Dotsero Springs Salinity Control Unit was authorized in 1980 for feasibility planning. The resulting recommended plan called for approximately 5000 acres of evaporation ponds at the Two Road site. The State of Colorado, which must approve the project, has rejected the evaporation ponds design. The final report of the State on the future of the project has not yet been published; however, less expensive salinity control projects exist, and it is unlikely that the Glenwood-Dotsero project will be further considered in the near future (Mezei, 1985).

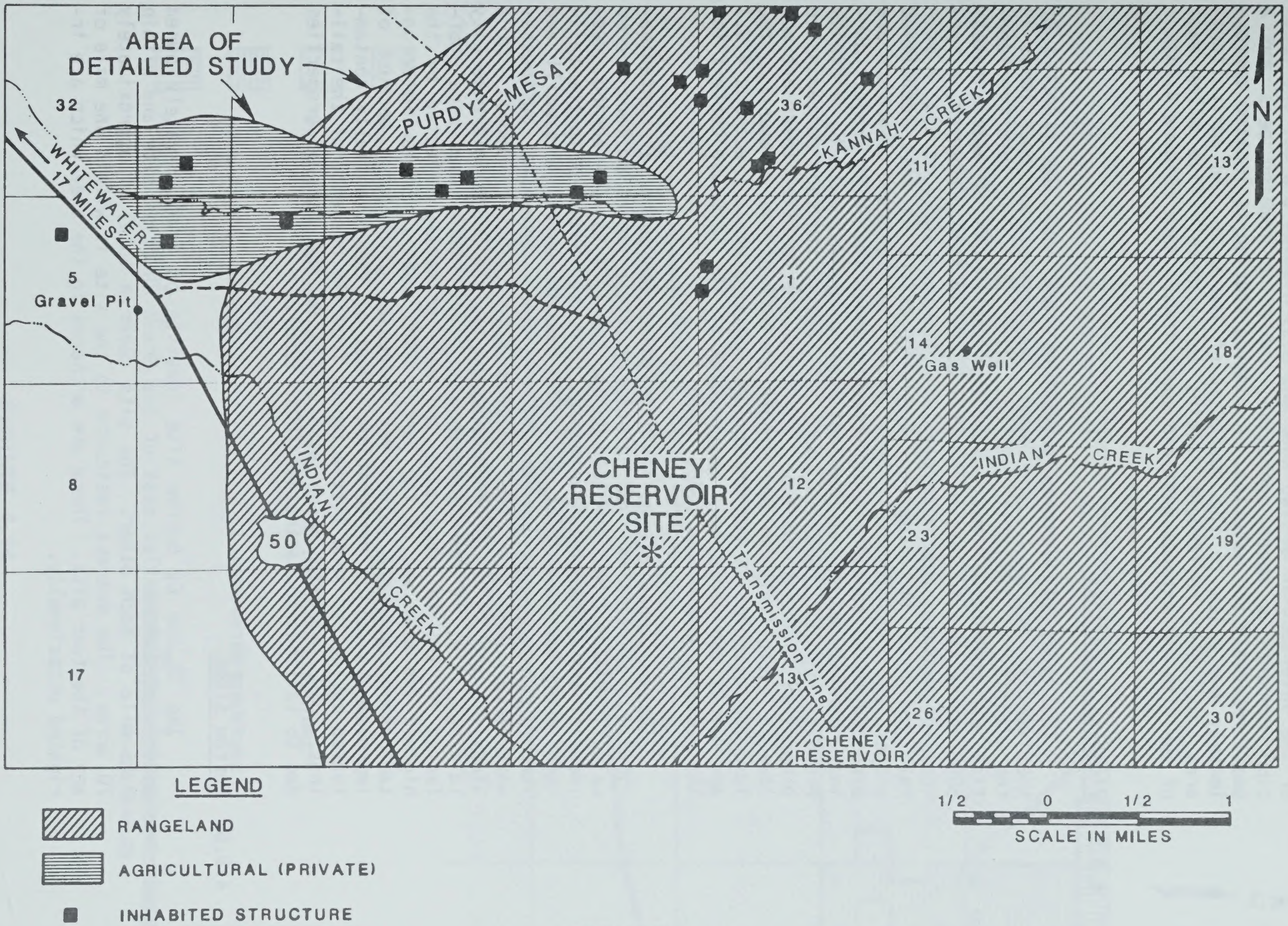


FIGURE 4.13
LAND USE IN THE VICINITY OF THE CHENEY RESERVOIR SITE

The nearest residence to the site is a mobile home just east of the intersection of Two Road and U.S. Highway 6 & 50; the location supports a sheep operation, including lambing pens and a small reservoir for watering. A pumping station is located approximately two miles to the southeast of the site. An agricultural area, including residences, begins approximately five miles east of the site and extends east and south toward Mack (Figure 4.14).

4.9.5 Vicinity properties

The types of vicinity properties that would be affected by the remedial action include homes, businesses, and open lands in the vicinity of the mill tailings site. Building lots (residential and commercial) may range from small lots of approximately 5000 square feet to lots of several acres in size. However, a typical lot measures approximately 100 x 100 feet (0.23 acre). A private residence or commercial building exists on most identified properties. Approximately 3465 properties in Grand Junction are expected to be candidates for cleanup under the UMTRA Project during remedial action at the tailings pile (Appendix L, Vicinity Property Report). Because there are several thousand contaminated properties in Grand Junction, and because properties there are not located exclusively in any single section of the community, the land use description for Grand Junction as a whole (Sections 4.9.1 and 4.9.2) can serve as a description of the land use context for the vicinity properties (DOE, 1985).

The existence of the tailings piles and potential contamination of properties has had relatively little impact on land use or values. Within Grand Junction during the 1974 to 1984 period, residential and commercial development increased adjacent to the tailings site; an additional 50 to 60 housing units, a sawmill and lumber yard, several warehouses, and other commercial businesses were established near the tailings site (Metzner, 1984). In a study of land values at, and adjacent to, the South Salt Lake City tailings site, it was found that adjacent land values were unaffected by the tailings pile and were primarily affected by the highest and best use of the parcel (DOE, 1984). Following decontamination, property values may increase, principally because of improvements during restoration. Most of the potentially contaminated businesses show little impact from the presence of the tailings. DOE property value assessments do not devalue properties due to tailings contamination (DOE, 1985).

4.9.6 Borrow sites

The 32 and C½ borrow site consists of four privately owned pits located 6.5 miles east of the Grand Junction site and within 0.25 mile of each other. The pits cover a total of approximately 70 acres. The nearest residence to the site is within one mile of any of the four pits. There are orchards in the area which are irrigated occasionally.

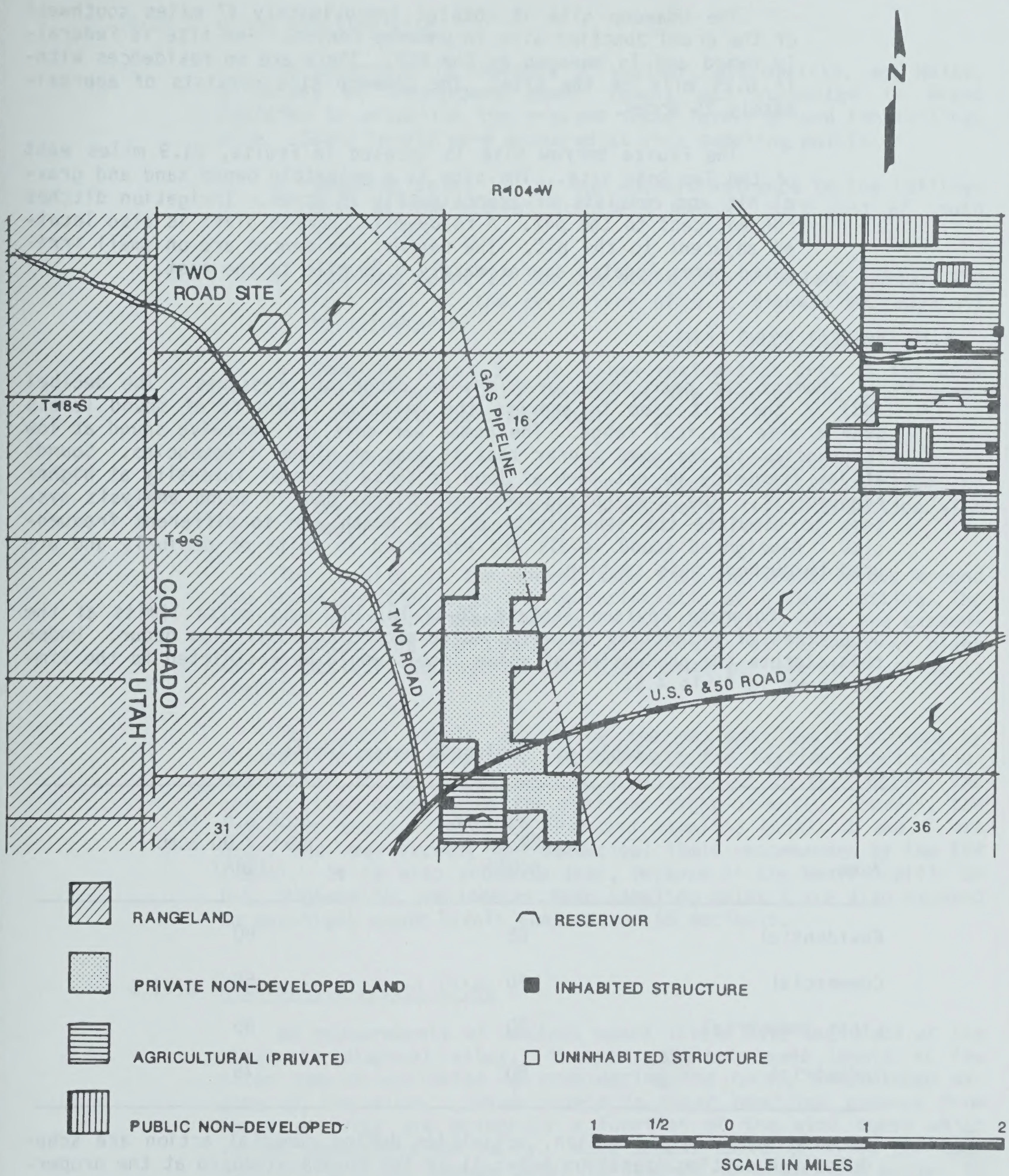


FIGURE 4.14
LAND USE IN THE VICINITY OF THE TWO ROAD SITE

The Unaweep site is located approximately 47 miles southwest of the Grand Junction site in Unaweep Canyon. The site is Federally owned and is managed by the BLM. There are no residences within 0.25 mile of the site. The Unaweep site consists of approximately 25 acres.

The Fruita borrow site is located in Fruita, 21.9 miles east of the Two Road site. The site is a privately owned sand and gravel pit and consists of approximately 10 acres. Irrigation ditches run adjacent to the pit. A ready-mix concrete plant is also located adjacent to the pit. The nearest residences are on small irrigated farms located approximately 0.25 mile to the east.

4.10 AMBIENT SOUND LEVELS

Humans can hear sound over a wide range of pressures. The decibel (dB) is the unit used to express the relative intensity of sound levels over a wide physical range. The human ear does not perceive sound at low frequencies in the same manner that it does at higher frequencies. Sounds at low frequency do not seem as loud as those of equal intensity at higher frequencies. The A-weighting network is provided in sound analysis systems to simulate the sensitivity of the human ear to different frequencies. A-weighted sound levels are expressed in units of decibels and are used throughout this section.

The Colorado Revised Statute 25-12-101-108 sets noise limits at the boundaries of properties on which noise-producing activities occur. Under this statute the production of noise levels would be restricted to the limits shown in Table 4.5.

Table 4.5 Colorado noise limits

Zone	7:00 a.m. to next 7:00 p.m. (dBA)	7:00 p.m. to next 7:00 a.m. (dBA)
Residential	55	50
Commercial	60	55
Light industrial	70	65
Industrial	80[a]	75

[a]Because of noise production, activities during remedial action are scheduled for daytime operation only; it is the 80-dBA standard at the property line that would need to be met.

4.10.1 Grand Junction site

As described in Appendix D, Weather, Air Quality, and Noise, a survey of background sound levels was conducted in Grand Junction to establish the present sound levels around the tailings pile. Sound levels were measured at four sampling points:

- o Sampling point 1: at the western entrance to the tailings area at the end of Struthers Avenue, just east of South 9th Street.
- o Sampling point 2: on the south side of Noland Avenue, 150 feet west of the centerline of U.S. Highway 50, adjacent to a junkyard.
- o Sampling point 3: in a new residential area at the dead end of Santa Clara Avenue, at the edge of the bluff overlooking the Colorado River.
- o Sampling point 4: in the industrial area to the north of the tailings area and the abandoned filtration plant, on the south side of Winters Avenue at its intersection with South 15th Street.

The results of the survey show that the sound levels around the Grand Junction site are characteristic of a town setting. The residual background sound levels (i.e., the levels that are exceeded 90 percent of the time) are higher than 35 decibels at night and 45 decibels during the day. The principal source of noise is traffic.

The sound levels are below the maximum levels allowed by Colorado noise regulations (80 decibels for daytime construction activities or rail transport at a distance of 25 feet beyond the construction property or the railroad right-of-way). However, the day-night sound levels (L_{dn}) around sampling points 1 and 3 are near, and may exceed, the 55-decibel limit recommended by the EPA (1974). It is also probable that, because of the heavy traffic on U.S. Highway 50, residences near sampling point 2 are also exposed to day-night sound levels that exceed 55 decibels.

4.10.2 Alternate disposal sites

No measurements of ambient sound levels have been made at the alternate disposal sites. However, ambient sound levels at the sites can be estimated by considering the rural, undeveloped nature of the sites. Sound levels in rural locations removed from human activity are primarily a function of the wind speed which varies seasonally and daily. Wind speeds above 12 miles per hour normally produce enough local turbulence in trees and bushes to dominate other natural sounds. In periods of calm, the noises made by birds and insects predominate. Distant traffic may also be heard at the Cheney Reservoir and Two Road sites. The perceptibility of noise from traffic is governed by distance from the road, road conditions, the speed at which vehicles are traveling, and weather conditions. Day-night sound levels at both sites are expected to be approximately equivalent to the level listed for "rural, undeveloped" in Table 4.6.

Table 4.6 Typical values of day-night sound levels, L_{dn}[a]

Land use description	Population density (people/mi^2)	L_{dn}-dBA
Rural, undeveloped	20	35
Rural, partially developed	60	40
Quiet suburban	200	45
Normal suburban	600	50
Urban	2,000	55
Noisy urban	6,000	60
Very noisy urban	20,000	65

[a]Day-night sound level (L_{dn}) is an EPA description of environmental sound. It is the average of daytime and nighttime A-weighted energy-equivalent sound levels with nighttime sound given a penalty of 10 decibels.

Ref. National Academy of Sciences, 1977.

4.10.3 Vicinity properties

The vicinity properties are mainly residential and commercial properties, and some open lands. No measures of ambient sound levels have been made at any vicinity properties. Ambient sound levels at these properties undoubtedly vary greatly depending on associated land uses. Day-night sound levels would be expected to range from approximately 40 decibels in rural, partially developed areas to 60 decibels or more in the most urbanized portions of Grand Junction.

4.10.4 Borrow sites

No sound measurements have been taken at any of the borrow sites. The 32 and C½ and Fruita borrow sites are both located in rural, partially developed areas that would probably be characterized by day-night sound levels of 40 to 45 decibels. The Unaweep Canyon site is in a rural, undeveloped area that would probably have a day-night sound level under 40 decibels. None of the borrow sites have residences within 0.25 mile.

4.11 SCENIC, HISTORICAL, AND CULTURAL RESOURCES

4.11.1 Scenic resources

Grand Junction site

The visual characteristics of the Grand Junction site are typical of industrial areas, although there are many nearby open, vacant areas. A prominent bluff with residential development on top characterizes the landscape south of the Colorado River, south of the processing site. Several neighborhoods in this area have direct views of the site.

Since the site is open and has little or no vegetation, its visual appearance is somewhat neutral. It neither adds to nor significantly detracts from the overall appearance of the industrial section of Grand Junction. This area of town can be seen from the Colorado National Monument; however, from this viewing distance of more than 10 miles, the site blends into the existing urban fabric and appears as open space.

The site is not on any major road, and the railroad is a mile away. Thus, the site is primarily seen either as a midground or a background view. The Colorado River valley is considered to be a Class 4 visual resource by the BLM (Appendix J, Scenic, Cultural, and Historic Information, Section J.1). This is the lowest ranking in the Bureau's Visual Resource Management (VRM) program.

Cheney Reservoir site

The Cheney Reservoir site is nearly flat, open rangeland with scrub vegetation. The natural open character is broken by the transmission line that crosses the site. This site is approximately two miles from U.S. Highway 50 and is at least 200 feet higher in elevation than the highway. The site cannot be seen from U.S. Highway 50. The land surrounding the site is rolling terrain with scrub vegetation. An intermittent stream, Indian Creek, runs along the southeastern edge of the site. Grand Mesa, approximately six miles northeast, provides an impressive scenic backdrop to the site.

The site area is assigned to the VRM Class 3 by the BLM, but is surrounded by lands classified as Class 2, the highest current classification in this BLM district. Class 3 is managed for development to be subordinate to the landscape, and Class 2 does not allow for any management activity to be evident in the landscape (Appendix J, Scenic, Cultural, and Historic Information).

The site can be seen from Grand Mesa and parts of the Grand Mesa National Forest, including one formal recreation area approximately five miles to the northeast. However, the site appears mainly as a part of the background at such a distance.

Two Road site

The Two Road site is characterized by flat, open rangeland with sparse vegetation. Some topographical points of interest occur in the region. The Book Cliffs, with almost 2000 feet of relief, are approximately eight miles north of the site. Interstate 70 and U.S. Highway 6 & 50 cannot be easily seen from the site. Bitter Creek, an intermittent stream, runs north to south just west of the site. In addition, an unnamed tributary of Bitter Creek runs along the eastern edge of the site.

The Two Road area is assigned to VRM Class 3 by the BLM.

Vicinity properties

The vicinity properties include commercial as well as residential structures. This is a diverse group and the scenic values associated with them are typical of an urban setting.

Borrow sites

The scenic values of the borrow sites are typical of the local scenic values of the Grand Valley. Those borrow sites that are located closer to communities have typical urban scenic resources in the area. The Unaweep Canyon has a VRM classification of 2. The 32 and C½ and Fruita sites are in VRM Class 4.

4.11.2 Prehistoric and historic resources

In the region of Grand Junction and the alternate sites, evidence of human habitation goes back to the Paleoindian Period (10,000 to 5500 B.C.). Archaeological remains of this period consist mainly of fragmentary or isolated finds of the characteristic spear tips. More extensive remains of this period have been found elsewhere in North America. Evidence dating to the Archaic Period (5500 B.C. to A.D. 500) is quite plentiful. Small and large sites consisting of chipped-stone debris, tools, and open hearths are known. The next historic period, the Formative (A.D. 500 to 1200), is recorded by remains of pottery, masonry architecture, and drawings on rock faces. The sites of this period that yield masonry structures, ceramics, or cultigens are rare. It should be noted that recent archaeological investigations have indicated that the transition between the Archaic and Formation periods was not as definitive as other periods. Recent evidence indicates that the nomadic group never really disappeared, and continued into the next period (Gooding and Shields, 1985).

During the latter part of the next period, the Protohistoric (A.D. 1200 to 1820), Spanish explorers from Santa Fe, New Mexico, entered the Grand Junction area; however, they left little evidence of their visits. Aboriginal remains from the Protohistoric Period are, on the other hand, common in the region. They include campsites and scatters of artifacts.

European incursions became more frequent and organized at the beginning of the Historic Period (A.D. 1820 to 1932). For nearly two decades beginning in 1863, the region was a reservation of the Ute Indians. After the Utes were expelled in 1880, full-scale settlement by Euroamericans ensued. Communities like Grand Junction were established during the latter part of the nineteenth century. Railroads and roads were built along the Colorado River in the early years of the twentieth century.

The region is known for cycles of mining activity. The mining of coal goes back to the 1880s. The mining and milling of uranium and vanadium began in the 1920s and 1930s.

4.11.3 Cultural resources

Information on the regional historic and cultural resources is contained in Appendix J, Scenic, Cultural, and Historic Information.

Grand Junction site

The area around the Grand Junction tailings site was involved in the early development of the city. The site itself once housed a portion of the first sugar-beet refinery in Colorado, built in 1899. The refinery was converted to the uranium mill that produced the tailings; however, the original buildings were apparently demolished or greatly altered, and the site itself has been extensively disturbed. The State Historic Preservation Office (SHPO) has recently determined that the mill is not eligible to the National Register of Historic Places (NRHP) (Wildesen, 1986).

Cheney Reservoir site

The Cheney Reservoir site and the surrounding area contain a high density of potentially significant cultural resources. There are two concentrations of cultural resources in the Cheney Reservoir study area. One occupies a low ridge that cuts diagonally (SW/NE) through the center of the study area and the other is in the southeast corner of the study area. The southern concentration has the greater artifact density of the two (GRI, 1985). The SHPO has determined that four lithic scatters, two sites in each concentration, need more data to determine their eligibility. More information is given in Appendix J, Scenic, Cultural, and Historic Information.

Two Road site

The Two Road vicinity contains one campsite/lithic scatter determined by SHPO to be eligible to the NRHP. An additional lithic scatter site needs additional data for determination of eligibility. The sites generally overlook the East Fork of Bitter Creek more than one mile from the disposal site (GRI, 1985).

Vicinity properties

The majority of vicinity properties are younger than 50 years. They are therefore ineligible for inclusion to the NRHP. It is possible that a few vicinity properties (ones older than 50 years) could be eligible to the NRHP. However, to date none have been identified. A cultural resource survey would be conducted for any vicinity property 50 years old or older and consultation with SHPO would be conducted if these structures were to be impacted.

Borrow sites

The 32 and C½ borrow site is at existing commercial locations and, as a result, the areas have been disturbed and are not expected to contain cultural resources. The Unaweep Canyon site has not been surveyed. Prior to any surface disturbances, cultural resource surveys would be conducted for all borrow sites to be used.

4.12 SOCIOECONOMIC CHARACTERISTICS

The following is a description of the socioeconomic conditions of the Grand Junction area. This material summarizes more detailed data presented in Appendix K, Socioeconomics and Land Use Information.

4.12.1 Population

The 1980 populations of Mesa County and Grand Junction, as tabulated by the U.S. Bureau of the Census, were 81,530 and 28,144, respectively. These populations represented increases from 1970 census counts of 49.9 percent for Mesa County (1970 population, 54,374) and 39.5 percent for Grand Junction (1970 population, 20,170). However, declines in energy-related activity in the area may have caused a decline in the rate of population growth more recently. Estimates of urban area population trends show Mesa County and Grand Junction to be losing population in the period between 1984 and 1986. The estimated populations of Mesa County and Grand Junction for 1986 are 81,000 and 28,000, respectively (Grand Junction Planning Department, 1986). These are expected to be the lowest points to which the respective populations will fall. Projections for future growth in population are based on assumptions that energy prices will recover in the remaining part of the decade and will remain strong on into the 1990s.

In 1980, the median age in Mesa County was 29.0 years. The County population was 95.8 percent white, 0.3 percent black, and 3.9 percent was composed of other races. People of Spanish origin comprised seven percent of the total population. The average household size in Mesa County declined from 2.97 in 1970 to 2.67 in 1980. The 1980 average household size in Grand Junction, 2.30, was smaller than the Mesa County average and the average of 2.65 for Colorado as a whole (U.S. Department of Commerce, 1982a, 1981, 1971).

4.12.2 Social and economic structure

The economic structure of Mesa County differs substantially from the overall economic structures of the State of Colorado and the United States. Mining is a major economic sector in Mesa County; it represented 11.4 percent of 1980 earned income, as opposed to 4.9 percent of the state earnings. Compared to the state and nation, manufacturing is a relatively small component of the Mesa County economy. The services, government, and retail trade sectors are the largest economic sectors in Mesa County. These sectors are followed by mining, construction, and transportation/public utilities in terms of their proportion of county income earned (U.S. Department of Commerce, 1982b).

The 1980 per capita personal income in Mesa County was $8,630, considerably below the state-wide average of $10,033 (U.S. Department of Commerce, 1982b). Projections show Mesa County per capita personal income, in real dollar terms, is expected to remain below the 1980 level until 1990, achieving a 5.1 percent real increase by 2000 (Planning and Assessment System, 1984). Mesa County commercial bank deposits increased 464 percent between 1970 and 1983 (from $70.7 million to $398.8 million); this represented a per capita increase in bank deposits from $1,300 to $4,344, or 234 percent (Denver Research Institute, 1984).

4.12.3 Work force

The total number of employed in Mesa County grew from 27,684 in 1975 to 38,105 in 1980, a 37.6 percent increase. This represented a higher percentage increase in employment than experienced by the state (25.8 percent) and the nation as a whole (14.9 percent) during the period. The services sector employed the largest number of people in 1980 in Mesa County (7185), followed by retail trade (6747), government (5447), and construction (2738). There were a total of 5027 proprietors in the county in 1980 (U.S. Department of Commerce, 1982b).

The 1983 annual average unemployment rates for Mesa County and Colorado were 11.7 percent and 6.6 percent, respectively. The county rate was below that for the state as a whole during the 1975 to 1978 period. Slowdowns in oil shale development were largely responsible for the large increase in the county unemployment rate (from 5.9 percent to 10.7 percent) between 1981 and 1982 (U.S. Bureau of Labor Statistics, 1985).

The Mesa County labor force is expected to increase from 39,798 in 1985 to 45,459 in 2000. During the same period, the unemployment rate is expected to decline from 8.8 percent to five percent. The labor force participation rate is expected to increase over the period from 47 percent to 49 percent. Mining, construction, and manufacturing sectors are expected to make the largest percentage employment increases. The percentage of total county employment contained in the government, services, finance/insurance/real estate, wholesale/retail trade, transportation/communication/public utilities, agriculture labor, and agriculture proprietors sectors are expected to decline (Planning and Assessment System, 1984, 1985).

4.12.4 Housing

In 1980 there were a total of 32,573 housing units in Mesa County, of which 12,706 were located in Grand Junction (39.0 percent). The county (city) rental unit vacancy rate was 9.1 (4.2) percent (U.S. Department of Commerce, 1982a). More recent determinations of rental unit vacancy rates have not yet been made.

The Grand Junction Planning Department conducted a survey of vacancy rates by type of housing in the city of Grand Junction (Grand Junction Planning Department, 1985). A comparison of city vacancy rates in 1980 and 1985 appears in Table 4.7 below.

Table 4.7 Residential vacancy rates by type of housing in the city of Grand Junction, 1980 and 1985

	Year	
Type of housing	1980	1985
Single family	5.4%	12.5%
Multi-family	10.6%	19.0-20.0%
Mobile home	5.6%	23.0%
Overall	7.0%	14.2%

According to the Colorado West Area Council of Governments, an estimated 4338 (646) housing units were built between 1980 and 1982 in the county (city). The Grand Junction Planning Department has noted, however, that there is currently little speculative or tract construction in the Grand Junction area in spite of low interest rates. This is because of a large inventory of housing offered for sale. In recent years, between 1500 and 2500 units spanning a wide range of prices are put on the local residential housing market annually. The Planning Department cites the dearth of energy-related activity in the Grand Junction area as a prime factor in the incidency of vacancy.

The 1980 median values of owner-occupied housing in Mesa County and Grand Junction were $56,700 and $49,700, respectively. Grand Junction contained 77.2 percent of Mesa County owner-occupied housing units (U.S. Department of Commerce, 1982b).

4.12.5 Government

Government structure

Mesa County has three county commissioners, a clerk, a treasurer, and an assessor; each serves a four-year term of office. A county manager oversees finances and services. The services include law enforcement, road construction and maintenance, planning and zoning, building and sanitation inspections, and a county-operated welfare program. The county also has a museum/library department and a parks and recreation department (Norman, 1985).

Of the cities and towns in Mesa County, Grand Junction, Fruita, and Palisade have a council-manager form of government. DeBeque and Collbran share a manager and have separate councils. DeBeque and Palisade have governments organized according to Colorado statutes, while Grand Junction and Fruita have developed home-rule charters. Grand Junction has a seven-member city council; the remaining towns have six-member councils (Norman, 1985).

Fiscal characteristics

Total general revenues for all local governments in Mesa County, including county, municipal, township, and special district governments, were $105.7 million in fiscal year 1982. Intergovernmental transfers accounted for 33.3 percent of the total. Per capita property taxes were $357 in Mesa County, below the $417 per capita figure state-wide (U.S. Department of Commerce, 1984a). The city of Grand Junction received $17.1 million in general revenues during fiscal year 1982; 9.4 percent came from intergovernmental grants, while the remainder came from local sources (U.S. Department of Commerce, 1984a,b).

Direct general expenditures for all local governments in Mesa County totalled $106.1 million for fiscal year 1982. Education represented the largest share of total county expenditures (41.6 percent), followed by public welfare (7.3 percent), highways (6.5 percent), and health/hospitals (1.7 percent). The city of Grand Junction had $14.1 million in direct general expenditures during fiscal year 1982; the largest share of city expenditures was spent on highways (17.5 percent). Direct general expenditures per capita were $1,306 in Mesa County, slightly below the $1,324 figure for Colorado as a whole (U.S. Department of Commerce, 1984a,b).

4.12.6 Community services

Education

The number of students enrolled in Mesa County's three school districts during the 1984-1985 school year totalled 16,053, or 2.9 percent of the state total. The largest of the three districts is the Mesa County Valley School District, which had an enrollment of 15,581. Plateau Valley and DeBeque School Districts had enrollments of 359 and 113, respectively. The student-to-teacher ratios were 19.0, 13.8, and 8.6 for the Mesa County Valley, Plateau Valley, and DeBeque School Districts, respectively; the ratio for the state was 17.1. The average expenditure per pupil during calendar year 1983 was highest in the DeBeque district ($5,134), followed by Plateau Valley ($3,414) and Mesa County Valley ($3,043); the state average expenditure per pupil was $3,695 (Colorado Department of Education, 1982, 1984a,b).

Hospitals and health services

Mesa County contains four hospitals, three of which are in Grand Junction. There are a total of 461 licensed hospital beds, 264 of which are in Saint Mary's Hospital and Medical Center in Grand Junction. The county has five hospital beds per 1000 residents, which is higher than the state average of 4.3 (U.S. Department of Health and Human Services, 1981).

Community health, mental health, and alcohol and drug abuse treatment services are available through a variety of programs, institutions, and facilities (see Appendix K, Socioeconomics and Land Use Information). Mesa County has four nursing homes and services for the developmentally disabled.

Water supplies, waste-water treatment, and public utilities

The water supply of most of the residents in Mesa County is from wells, springs, creeks, and other surface-water sources. The City of Grand Junction supplies water to 19,000 people. The estimated daily water consumption in Grand Junction is 6.65 million gallons in the summer and 2.85 million gallons in the winter (Bowman, 1985).

The most common type of waste-water treatment facility used in Mesa County is the lagoon. However, the largest facility is an activated-sludge facility in Grand Junction. This newly completed facility has a capacity of 12.5 million gallons per day and may be expanded to 25.0 million gallons per day although it is currently operating well below capacity (Bowman, 1985).

Electricity is supplied to the Grand Junction area by the Public Service Company of Colorado and by Grand Valley Rural Power lines. Telephone service is provided by Mountain Bell. Natural gas service is provided by the Public Service Company of Colorado. According to John Kenney, Acting Public Works Director of the City of Grand Junction, the area's utilities would be able to accommodate any additional demand associated with remedial action (Kenney, 1985).

Police and fire protection

The Grand Junction Police Department has 67 sworn officers, 33 of whom are authorized civilians, and 30 police vehicles (Evers, 1985). The Mesa County Sheriff's Department has 27 road deputies, six sergeants, a staff of 83 people, and 40 vehicles. A central communications center in Grand Junction serves as a dispatch center for emergency services of the police, sheriff's, and fire departments (Mesa County Sheriff's Department, 1985).

The Grand Junction Fire Department provides fire protection for the city of Grand Junction and for rural areas surrounding Grand Junction; the total service area includes 84 square miles. The fire department staff consists of 60 full-time firefighters. Fire-fighting equipment includes six 1250-gallon pumpers, one 750-gallon pumper, a 3500-gallon tanker, one 85-foot aerial platform, two rescue units, and one hazardous chemical unit (Campbell, 1985).

4.12.7 Transportation networks

Regional networks

Grand Junction is connected with other areas within Mesa County and areas outside Mesa County by a number of major highways. Interstate 70 is the primary east-west transportation route; it connects Grand Junction with Denver to the east and Utah locations to the west. U.S. Highway 6 & 50 is also an east-west route; it runs parallel and at times is coextensive with Interstate 70 (see Figure 4.1). U.S. Highway 50 is the principal highway connecting Grand Junction to points southeast (e.g., Delta and Montrose). State Highway 141 begins at Whitewater (10 miles southwest of Grand Junction), off U.S. Highway 50, and leads to southern locations such as Naturita and Slick Rock. State Highway 139 begins at Loma and runs north into Garfield and Rio Blanco counties.

The Denver and Rio Grande Western Railroad follows the Colorado River and connects Grand Junction with Mack 10 miles to the northwest, which is near the Two Road site.

The Montrose branch of the Denver and Rio Grande Western Railroad follows the Gunnison River out of Grand Junction and runs through Whitewater. The main line to Mack is a single track with several loop sidings parallel to the main line. It is used by 25 to 30 freight trains per day and a daily passenger train. Shipments in 1981 averaged an estimated 29 grade crossings between Grand Junction and Mack; most of them are equipped with active warning devices. The Montrose branch rail line, which runs to Whitewater, is a single heavy-duty track used primarily for coal trains and a freight train that runs to Montrose three or four times per week. The 1981 volume for this section of the railroad was estimated at nine million gross tons. There are approximately nine grade crossings along the Grand Junction-Whitewater route (DOE, 1983a).

The numbers of fatal, injury, and property traffic accidents have been declining in Mesa County recently. In 1981, there were a total of 3683 accidents; 33 fatal, 801 injury, and 2849 property damage accidents. In 1984, the accident total dropped to 1964; 11 fatal, 496 injury, and 1457 property damage accidents. The 1984 countywide fatal accident rate was 0.02 accidents per million vehicle-miles travelled. The 1984 countywide injury accident rate was 0.72 accidents per million vehicle-miles travelled. The total accident rate for Mesa County in 1984 was 2.85 accidents per million vehicle-miles travelled (Smith, 1985). The average rate of accidents and incidents on the Denver Rio Grande Western Railroad during 1980 and 1981 is estimated at 15.61 accidents and incidents per million train-miles; this compares favorably to the 26.75 average for all U.S. railroads (U.S. Department of Transportation, 1981, 1982).

Grand Junction site

In addition to the major highways described above, other highways in the Grand Junction vicinity support the regional transportation network. State Highway 146 runs north-south between U.S. Highway 50 and U.S. Highway 6 just east of Grand Junction. State Route 340 runs northwest-southeast between Grand Junction and Fruita and is located southwest of Interstate 70. Loop 70 is the business loop of Interstate 70, it has a junction with Interstate 70 near 32 Road, runs west to downtown Grand Junction where it is coextensive with Ute and Pitkin Avenues, and continues northwest coextensive with U.S. Highway 6 & 50 until the loop intersects Interstate 70 at the eastern edge of Grand Junction.

The average highway traffic for the roads described above ranges from 1100 vehicles per day on U.S. Highway 6 & 50 between Mack and Two Road to 21,500 vehicles per day on U.S. Highway 50 between Unaweep and South Avenues. Total traffic on U.S. Highway 50 ranges from 3800 vehicles per day (State Highway 141 to the Mesa-Delta County line) to 21,500 vehicles per day (Unaweep Avenue and South Avenue) (Trainor, 1985; Mesa County Engineer and Grand Junction City Engineer, 1983). Average daily traffic on selected county and city roads ranges from 400 vehicles per day on 4th Avenue between 7th Street and Riverside Park Drive to 8050 vehicles per day on 32 Road (State Highway 146) between D Road and B½ Road east of 5th Street (Trainor, 1985). Additional route-specific traffic information for roads in the Grand Junction vicinity is contained in Appendix K, Socioeconomics and Land Use Information.

Cheney Reservoir site

The Cheney Reservoir with truck transport alternative would involve partially separate outbound and inbound haul routes to reduce the intensity of the traffic-related impacts on any one road. Outbound trucks would use the following route from the Grand Junction site to the Cheney Reservoir site:

- o North on 15th Street to D Road.
- o East on D Road to 32 Road (State Highway 146).
- o South on 32 Road to U.S. Highway 50.
- o Southeast of U.S. Highway 50 to a point approximately 5.5 miles south of Whitewater.
- o East on the Cheney Reservoir access road approximately 3.8 miles to the site.

Trucks would return to the Grand Junction site using the following route from the Cheney Reservoir site:

- o West on dirt road 3.8 miles to U.S. Highway 50.
- o Northwest on U.S. Highway 50 to Noland Avenue.
- o East on Noland Avenue to 7th Street.
- o South on 7th Street to Struthers Avenue.
- o East on Struthers Avenue to the processing site.

These routes are also shown in Figures 4.15 and 4.16.

Traffic counts indicate that traffic encountered by trucks on the route to Cheney Reservoir would initially be light (less than 1100 vehicles per day on 15th Street). A greater amount of traffic (6900 vehicles per day) would be encountered as trucks pulled onto D Road. Traffic encountered on D Road would then gradually decrease (to 3700 vehicles per day) as the trucks approached 32 Road. Traffic initially encountered on 32 Road would be close to 8050 vehicles per day declining to 3700 vehicles per day as the trucks reached U.S. Highway 50. Traffic on U.S. Highway 50 to the turn-off for Cheney Reservoir would be relatively light, initially close to 4600 vehicles per day declining to approximately 3800 vehicles per day. Returning from Cheney to the processing site, traffic encountered would gradually increase from 3800 vehicles per day to 21,500 vehicles per day as trucks turned off the highway onto Noland Avenue. Once on Noland Avenue, the trucks would encounter traffic of less than 1100 vehicles per day (Trainor, 1985; Mesa County Engineer and Grand Junction City Engineer, 1983).

Disposal of the tailings at Cheney Reservoir with train and truck transport would involve first transporting the tailings 10 miles by train from the Grand Junction site to Whitewater. The tailings would then be transported 6.7 miles on U.S. Highway 50 by truck and then 3.8 miles on the Cheney Reservoir access road. The average daily traffic for the affected portion of U.S. Highway 50 is estimated at 3800 vehicles (Colorado Department of Highways, 1980).

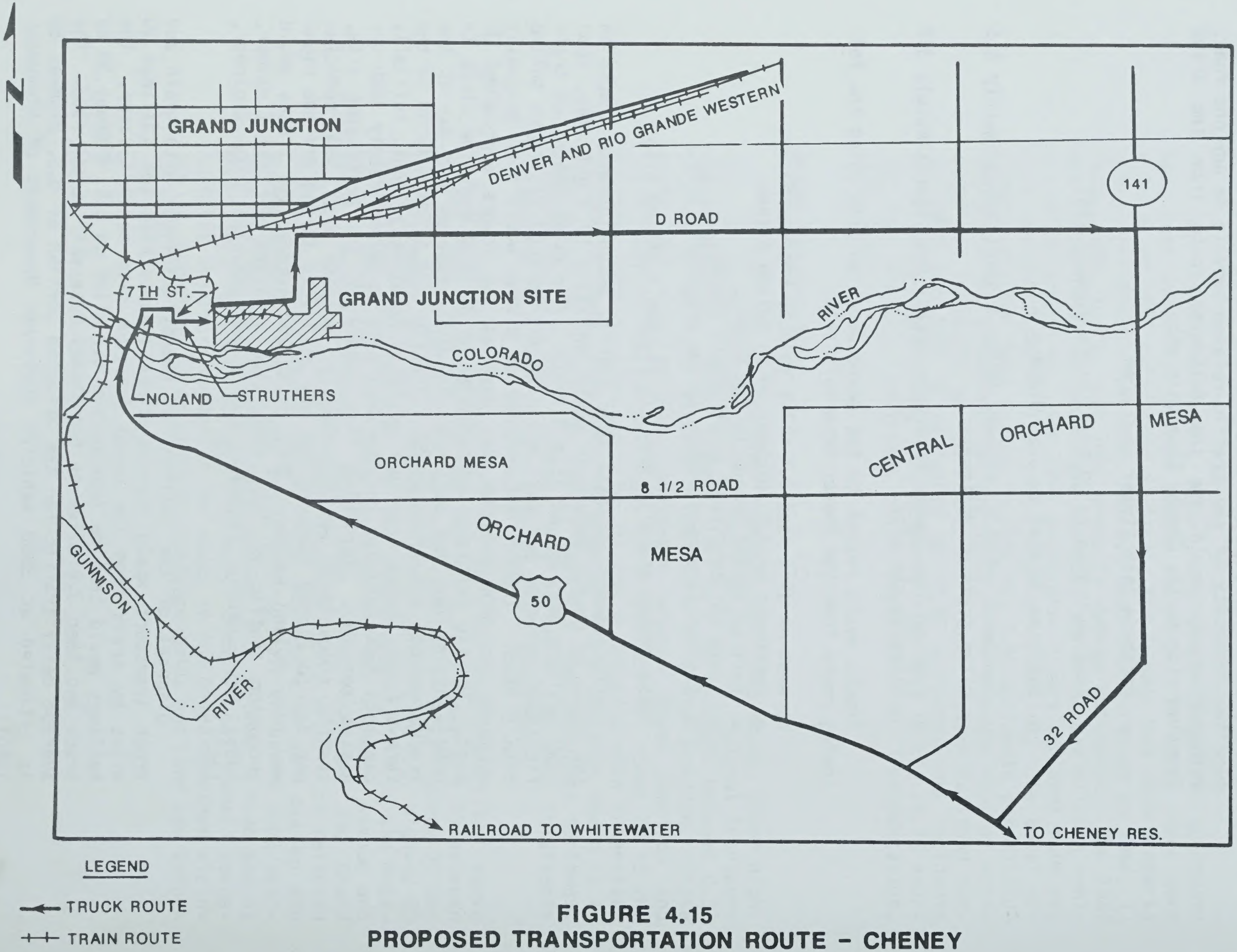


FIGURE 4.15
PROPOSED TRANSPORTATION ROUTE - CHENEY RESERVOIR ALTERNATE DISPOSAL SITE

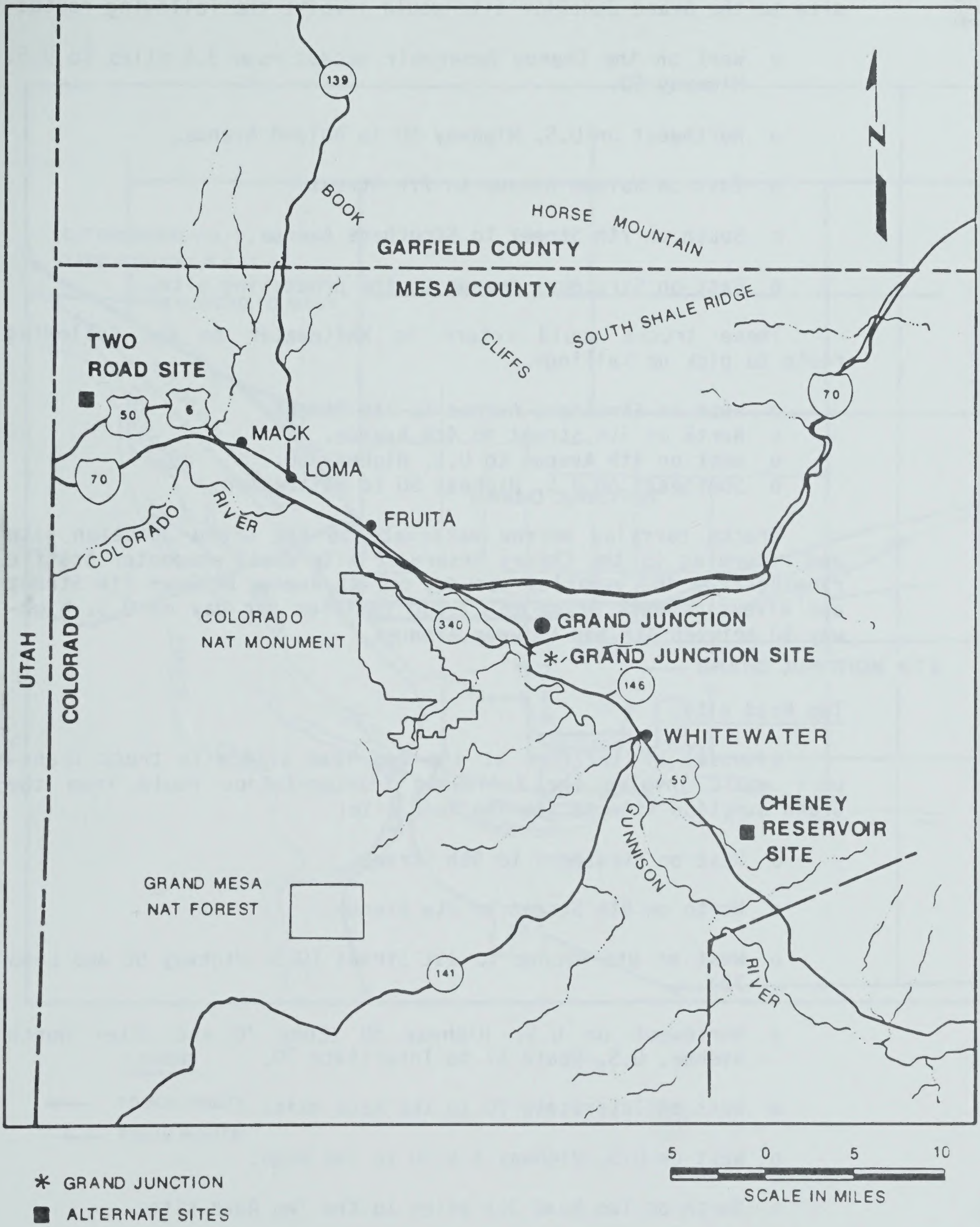


FIGURE 4.16
MAJOR HIGHWAYS IN THE VICINITY OF GRAND JUNCTION

Transportation of borrow material from the Cheney Reservoir site to the Grand Junction site would involve the following route:

- o West on the Cheney Reservoir access road 3.8 miles to U.S. Highway 50.

- o Northwest on U.S. Highway 50 to Noland Avenue.

- o East on Noland Avenue to 7th Street.

- o South on 7th Street to Struthers Avenue.

- o East on Struthers Avenue to the processing site.

These trucks would return to Whitewater on the following route to pick up tailings.

- o West on Struthers Avenue to 7th Street.
- o North on 7th Street to 4th Avenue.
- o West on 4th Avenue to U.S. Highway 50.
- o Southeast on U.S. Highway 50 to Whitewater.

Trucks carrying borrow materials to the Grand Junction site and returning to the Cheney Reservoir site would encounter traffic ranging from 400 vehicles per day on 4th Avenue between 7th Street and Riverside Park Drive to 21,500 vehicles per day on U.S. Highway 50 between 4th and Unaweep Avenues.

Two Road site

Disposal of tailings at the Two Road site with truck transport would involve the following transportation route from the Grand Junction site to the Two Road site:

- o West on Struthers to 9th Street.

- o North on 9th Street to Ute Avenue.

- o West on Ute Avenue to 1st Street (U.S. Highway 50 and Loop 70).

- o Northwest on U.S. Highway 50 (Loop 70 and after North Avenue, U.S. Route 6) to Interstate 70.

- o West on Interstate 70 to the Mack exit.

- o West on U.S. Highway 6 & 50 to Two Road.

- o North on Two Road 3.4 miles to the Two Road site.

This route is also shown in Figure 4.17.

Average daily traffic counts indicate the traffic encountered on the route would increase from 650 vehicles per day on Struthers to 8950 vehicles per day on 9th Street as the trucks reached Ute

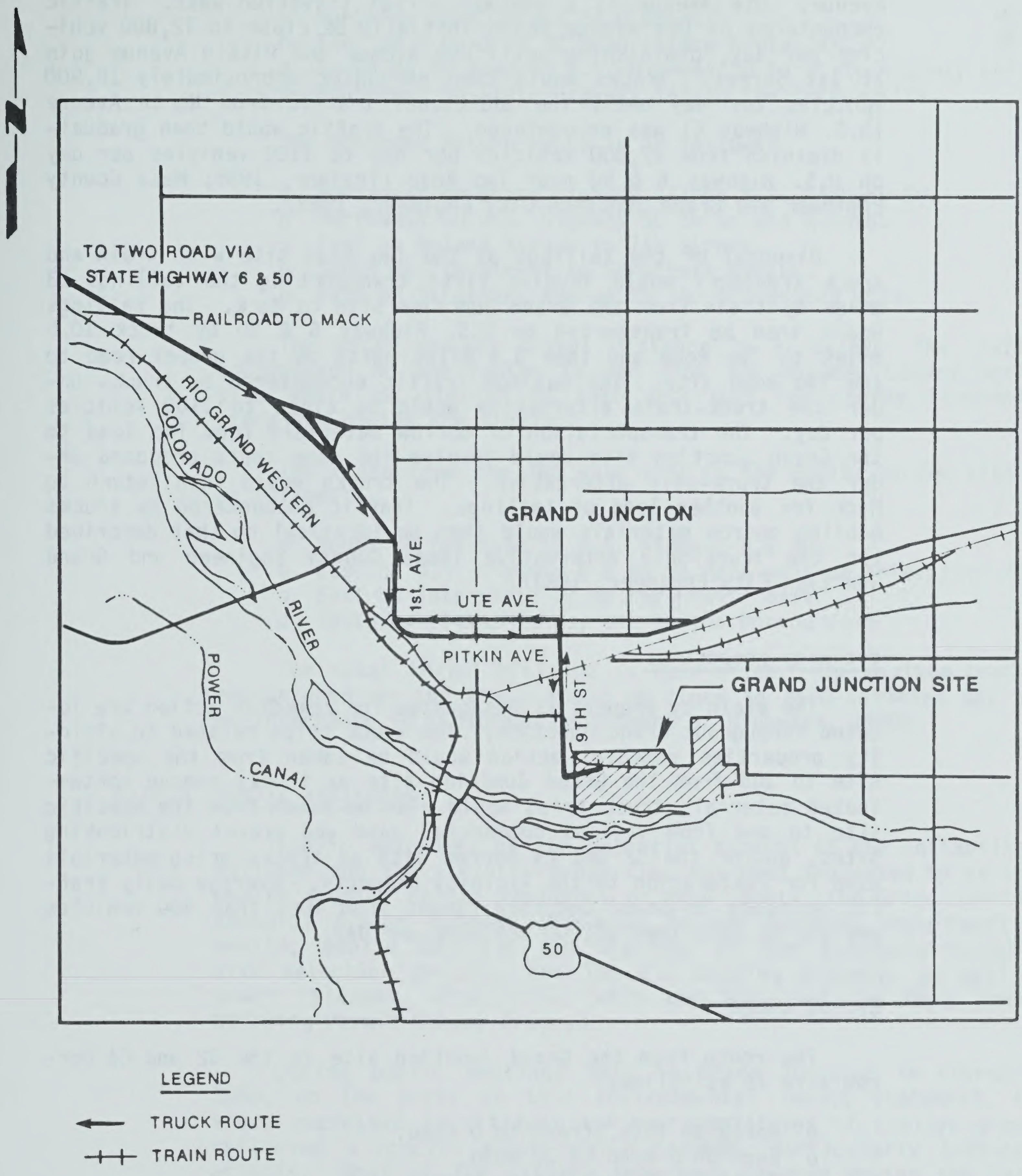


FIGURE 4.17

PROPOSED TRANSPORTATION ROUTE - TWO ROAD ALTERNATE DISPOSAL SITE

Avenue. Ute Avenue is a one-way street travelled west. Traffic encountered on Ute Avenue would initially be close to 12,800 vehicles per day, diminishing until Ute Avenue and Pitkin Avenue join at 1st Street. Trucks would then encounter approximately 18,900 vehicles per day until the additional traffic from North Avenue (U.S. Highway 6) was encountered. The traffic would then gradually diminish from 22,000 vehicles per day to 1100 vehicles per day on U.S. Highway 6 & 50 near Two Road (Trainor, 1985; Mesa County Engineer and Grand Junction City Engineer, 1983).

Disposal of the tailings at the Two Road site with train and truck transport would involve first transporting the tailings 23 miles by train from the Grand Junction site to Mack. The tailings would then be transported on U.S. Highway 6 & 50 by truck 10.5 miles to Two Road and then 3.4 miles north on the gravel road to the Two Road site. The maximum traffic encountered by trucks under the truck-train alternative would be close to 1100 vehicles per day. The transportation of borrow materials from Two Road to the Grand Junction site would involve the same route proposed under the truck-only alternative. The trucks would then return to Mack for another load of tailings. Traffic encountered by trucks hauling borrow materials would then be identical to that described for the truck-only alternative (Mesa County Engineer and Grand Junction City Engineer, 1983).

Vicinity properties

The vicinity properties designated for remedial action are located throughout Grand Junction. The truck trips related to vicinity properties remedial action would be taken from the specific site to and from the Grand Junction site as trucks remove contaminated material; truck trips would also be taken from the specific site to and from various commercial sand and gravel distributing sites, and/or the 32 and C½ borrow site as trucks bring materials used for restoration to the vicinity property. Average daily traffic on roads in Grand Junction ranges from less than 400 vehicles per day to more than 22,000 vehicles per day.

Borrow sites

The route from the Grand Junction site to the 32 and C½ borrow site is as follows:

- o North on 15th Street to D Road.
- o East on D Road to 32 Road.
- o South on 32 Road to the borrow site.

The total one-way travel distance is 6.5 miles. The traffic which trucks would encounter along this route would range from less than 1100 vehicles per day to 8050 vehicles per day (Trainor, 1985).

The route from the Grand Junction site to the Unaweep Canyon borrow site is as follows:

- o North on 15th Street to D Road.
- o East on D Road to 32 Road (State Route 146).
- o South on 32 Road to U.S. Highway 50 to State Highway 141.
- o Southwest on State Highway 141 to the borrow site.

The proposed return route is as follows:

- o Northeast on State Highway 141 to U.S. Highway 50.
- o Northwest on U.S. Highway 50 to Noland Avenue.
- o East on Noland Avenue to 7th Street.
- o South on 7th Street to Struthers Avenue.
- o East on Struthers Avenue to the processing site.

The total one-way travel distance is 47 miles. The traffic encountered on the routes to and from the Unaweep Canyon borrow site would be similar to that described for Cheney Reservoir, since the routes are similar.

The route from the Two Road site to the Fruita borrow site is as follows:

- o South on Two Road to U.S. Highway 6 & 50.
- o East on U.S. Highway 6 & 50 to Mack exit on Interstate 70.
- o East on Interstate 70 to the Fruita exit.
- o South on State Highway 340 to the borrow site.

The total travel distance is 21.7 miles. The maximum traffic encountered on the route would be close to 3400 vehicles per day on Interstate 70 (Colorado Department of Highways, 1980).

4.12.8 Public attitudes

Public awareness of the potential hazards of the unstabilized tailings and the vicinity properties has been increased by various health studies on the residents of Mesa County, the Grand Junction Remedial Action Program conducted by the Colorado Department of Health, public meetings and hearings on the alternate disposal site selection process, and the EIS scoping process, as well as press releases, discussions with the DOE, and the Mesa County Building Permit Survey Program.

During public meetings held in Grand Junction in February, 1983, on the scope of this environmental impact statement, the views expressed by citizens and representatives of citizen groups reflected a concern about health hazards, particularly long-term effects. Most of the citizen spokesmen favored moving the tailings to isolated areas. Several, including those representing organizations, were in favor of a remedial action that would provide local jobs and related boosts to the economy of Grand Junction. Citizens are generally in favor of the remedial action at vicinity properties and expressed the desire for open communication on the project. Public meetings were also held in June, 1985, to solicit additional public input into selection of the alternatives to be addressed in the EIS. Comments at this meeting were similar to those expressed during the February, 1983, public meeting. Numerous persons also expressed concern that the site selected for the disposal of the tailings would be used as a disposal site for other low-level radioactive waste and most persons were opposed to using the site for this purpose.

REFERENCES FOR SECTION 4.0

Abbey, R., 1976. "Risk Probabilities Associated with Tornado Windspeeds," in Proceedings of the Symposium on Tornadoes, Texas Tech University, June 22-24, pp. 177-236, Lubbock, Texas.

Archer, et al. (D. L. Archer, L. R. Kaeding, B. D. Buzchick, and C. W. McAda), 1985. "A Study of the Endangered Fishes of the Upper Colorado River - Final Report," U.S. Fish and Wildlife Service, Grand Junction, Colorado.

BFEC (Bendix Field Engineering Corporation), 1985. "Radiological Characterization of the Grand Junction, Colorado Uranium Mill Tailings Remedial Action Site," prepared by BFEC, Grand Junction, Colorado.

BLM (Bureau of Land Management), 1985a. "Draft Grand Junction Resource Management Plan and Environmental Impact Statement," U.S. Department of Interior, Bureau of Land Management, Grand Junction District, Colorado.

BLM (Bureau of Land Management), 1985b. Personal communication with Ron Lambeth, Biologist for Bureau of Land Management, Grand Junction, Colorado, with Steve Cox, Jacobs Engineering Group Inc., Albuquerque, New Mexico, dated May 24, 1985.

Behnke, R.J., and D.E. Benson, 1983. "Endangered and Threatened Fishes of the Upper Colorado River Basin," Cooperative Extension Service, Bulletin 503A, Colorado State University, Fort Collins, Colorado.

Biota (Biota Research and Consulting, Inc.), 1985a. "Black-Footed Ferret Survey in the Two Road Area of Western Colorado," prepared by Biota Research & Consulting, Inc., Jackson, Wyoming, for Jacobs Engineering Group Inc., Albuquerque, New Mexico.

Biota (Biota Research and Consulting, Inc.), 1985b. "Nocturnal Black-Footed Ferret Survey in the Two Road Area of Western Colorado," prepared by Biota Research and Consulting, Inc., Jackson, Wyoming, for Jacobs Engineering Group Inc., Albuquerque, New Mexico.

Bowman, D., 1985. Colorado Department of Health, Water Quality Control Division, Denver, Colorado, personal communication with Mark Pingle, Jacobs Engineering Group Inc., Pasadena, California, dated February, 1985.

Campbell, J., 1985. Operations Chief, Grand Junction Fire Department, Grand Junction, Colorado, personal communication with Mark Pingle, Jacobs Engineering Group Inc., Pasadena, California, dated April, 1985.

Cashion, W.B., 1973. Geologic and Structural Map of the Grand Junction Quadrangle, Colorado and Utah, U.S. Geological Survey, Miscellaneous Investigations Series Map I-736.

City/County Comprehensive Planning, 1983. The City-County Data Book, Grand Junction, Colorado.

City Planning Department, 1984. Grand Junction Zoning and Development Code, Grand Junction, Colorado.

CGS (Colorado Geological Survey), 1982. Preliminary Report on Potential Sites Suitable for Relocation and/or Reprocessing of the Grand Junction and Rifle Uranium Mill Tailings Pile, prepared by Four Corners Research Institute for the Department of Natural Resources, Denver, Colorado.

Clark et al. (T.W. Clark, T.M. Campbell, M.H. Schroeder, and L. Richardson), 1984. "Handbook of Methods for Locating Black-footed Ferrets," U.S. Bureau of Land Management, Wildlife Technical Bulletin No. 1, Cheyenne, Wyoming.

COE (U.S. Army Corps of Engineers), 1985. Written communication from G. McNure, Chief Regulatory Unit 4, Grand Junction, Colorado, to R. Peel, Jacobs Engineering Group Inc., Albuquerque, New Mexico, May 7, 1985.

COE (U.S. Army Corps of Engineers), 1976. Flood Hazard Information - Colorado River and Tributaries - Grand Junction, Colorado, U.S. Army Corps of Engineers, Sacramento, California.

Colorado Climatological Office, 1982. Climatic Listings & Summaries for 9 Stations, 1951-1981, Colorado State University, Fort Collins, Colorado.

Colorado Department of Education, 1982. Pupil Membership and Related Information, Fall 1983, Denver, Colorado.

Colorado Department of Education, 1984a. Certified Personnel Salaries and Related Information, Fall 1983, Denver, Colorado.

Colorado Department of Education, 1984b. Revenues and Expenditures, Calendar Year 1983, Denver, Colorado.

Colorado Department of Highways, 1980. Colorado Traffic Volume Study, Division of Planning, Denver, Colorado.

Colorado Department of Local Affairs, 1985. Population estimate for Grand Junction as of July 1, 1983, State of Colorado, Division of Local Government, Demographic Section, Denver, Colorado.

Colorado Division of Wildlife, 1983. Imperiled species list. Wildlife News 8(1):3.

Colorado Division of Wildlife, 1978. "Essential Habitat for Threatened or Endangered Wildlife in Colorado," Division of Wildlife, Denver, Colorado.

Colorado Natural Areas Program, 1982. "Threatened and Endangered Plants of Colorado," U.S. Fish and Wildlife Service, Denver, Colorado.

Cowardin et al. (L.M. Cowardin, V. Carter, F.C. Golet, and E.T. La Roe), 1979. "Classification of Wetlands and Deepwater Habitats in the United States," U.S. Fish and Wildlife Service, Office of Biological Services, FWS/OBS-79/31, Washington, D.C.

Critchfield, H., 1966. General Climatology, 2nd edition, Prentice-Hall, Inc., Englewood Cliffs, New Jersey.

DOE (U.S. Department of Energy), 1985. Programmatic Environmental Report for Remedial Actions at UMTRA Project Vicinity Properties, prepared by the U.S. Department of Energy, UMTRA Project Office, Albuquerque Operations Office, Albuquerque, New Mexico.

DOE (U.S. Department of Energy), 1984. Final Environmental Impact Statement of Remedial Actions at the Former Vitro Chemical Company Site South Salt Lake, Salt Lake County, DOE/EIS-0099-F, prepared by the U.S. Department of Energy, UMTRA Project Office, Albuquerque Operations Office, Albuquerque, New Mexico.

DOE (U.S. Department of Energy), 1983a. Unpublished reports prepared by NUS Corporation, Aurora, Colorado, under contract to Sandia National Laboratories (Contract No. 68-3473), for the U.S. Department of Energy, UMTRA Project Office, Albuquerque Operations Office, Albuquerque, New Mexico.

DOE (U.S. Department of Energy), 1983b. "Biological Assessment Related to Remedial Action at the Grand Junction and Rifle Sites," prepared by the U.S. Department of Energy, UMTRA Project Office, Albuquerque Operations Office, Albuquerque, New Mexico.

Davis, S.N., and R.J.M. DeWiest, 1965. Hydrogeology, John Wiley and Sons, Inc., New York, New York.

Denver Research Institute, 1984. Fiscal Impact Analysis, Volume 1, Parachute Creek Shale Oil Project, for Union Oil Company of California - Energy Mining Division, Denver, Colorado.

EPA (U.S. Environmental Protection Agency), 1984. Occupational Exposure to Ionizing Radiation in the United States, EPA 520/1-84-005, Washington, D.C.

EPA (U.S. Environmental Protection Agency), 1977. Outdoor Radon Study (1974-1975): An Evaluation of Ambient Radon-222 Concentration in Grand Junction, Colorado, Technical Note ORP/LV-77-1, EPA, Office of Radiation Programs, Las Vegas, Nevada.

EPA (U.S. Environmental Protection Agency), 1975. Gamma Radiation Surveys at Inactive Uranium Mill Sites, Technical Note ORP/LV-75-5, EPA, Las Vegas, Nevada.

EPA (U.S. Environmental Protection Agency), 1974. Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety, EPA 550/9-74-004, Washington, D.C.

Evers, Robert, 1985. Grand Junction Police Department, Grand Junction, Colorado, personal communication to Mark Pingle, Jacobs Engineering Group Inc., Pasadena, California, dated April, 1985.

FBDU (Ford, Bacon, Davis, Utah, Inc.), 1981. Engineering Assessment of Inactive Uranium Mill Tailings, Grand Junction Site, Grand Junction, Colorado, November, 1982, prepared by FBDU, Salt Lake City, Utah, for the U.S. Department of Energy, UMTRA Project Office, Albuquerque Operations Office, Albuquerque, New Mexico.

Flebbe, Gregg, 1986. Grand Junction Planning Department, personal communication to David Butler, Jacobs Engineering Group Inc., Pasadena, California, dated June 24, 1986.

GRI (Grand River Institute), 1985. "Class III Cultural Resource Inventories of Inactive Uranium Tailings Site at Grand Junction and Rifle, Colorado, and Four Alternate Tailings Disposal Sites in West-Central Colorado," Grand Junction, Colorado.

Gooding, J., and W. L. Shields, 1985. Sisyphus Shelter, Cultural Resources Series Number 18, U.S. Bureau of Land Management, Denver, Colorado.

Grand Junction Planning Department, 1986. "Technical Report No. 31: Population Estimates," Grand Junction, Colorado.

Grand Junction Planning Department, 1985. "Technical Report No. 1: Vacancy Survey," Grand Junction, Colorado.

Hillman, C.N., and T.W. Clark, 1980. "Mustela nigripes," Mammal Species No. 126, 3 pp.

Kaeding, L., 1985. U.S. Fish and Wildlife Service, Granddunction, Colorado, personal communication to Chuck Burt, Environmental Services, Jacobs Engineering Group Inc., Albuquerque, New Mexico, dated October, 1985.

Kenney, J., 1985. Acting Public Works Director, City of Grand Junction, Grand Junction, Colorado, personal communication to Mark Pingle, Jacobs Engineering Group Inc., Pasadena, California, dated April, 1985.

Kirkham, R.M., and W.P. Rogers, 1981. "Earthquake Potential in Colorado: A Preliminary Evaluation," Colorado Geological Survey Bulletin, No. 43.

Kuchler, A.W., 1964. Potential Natural Vegetation of the Conterminous United States, American Geographic Society Special Publication No. 36, New York, New York (Map).

Lockhart, M., 1985. U.S. Fish and Wildlife Service, Grand Junction, Colorado, personal communication to Chuck Burt, Environmental Services, Jacobs Engineering Group Inc., Albuquerque, New Mexico, dated August 21, 1985.

Logan-Pearce, C., 1985. Realty Specialist, U.S. Department of the Interior, Bureau of Land Management, Grand Junction, Colorado, personal communication to Mark Pingle, Jacobs Engineering Group Inc., Pasadena, California, dated April, 1985.

Lohman, S.W., 1981. "The Geologic Storm of the Colorado National Monument," U.S. Geological Survey Bulletin.

Lohman, S.W., 1965. Geology and Artesian Water Supply Grand Junction Area, Colorado, U.S. Geological Survey Professional Paper 451, U.S. Government Printing Office, Washington, D.C.

MSRD (Mountain States Research and Development), 1982. Economic Evaluation of Inactive Uranium Mill Tailings; Grand Junction Site, Grand Junction, Colorado, prepared by MSRD, Tucson, Arizona, for the U.S. Department of Energy, UMTRA Project Office, Albuquerque Operations Office, Albuquerque, New Mexico.

McVean, Doug, 1986. U.S. Bureau of Land Management, Grand Junction, Colorado, personal communication to Marc Nelson, Jacobs Engineering Group Inc., Albuquerque, New Mexico, dated January, 1985.

Metzner, C., 1984. Director of City Planning, Grand Junction, Colorado, personal communication to Chris Nagel, Jacobs Engineering Group Inc., Pasadena, California.

Mezei, N., 1985. Planning Team Leader - Glenwood-Dotsero Springs Unit; Colorado River Water Quality Improvement Program, U.S. Department of the Interior, Bureau of Reclamation, Grand Junction, Colorado, personal communication to Mark Pingle, Jacobs Engineering Group Inc., Pasadena, California, dated May, 1985.

Mesa County Engineer and Grand Junction City Engineer, 1983. Personal communication with Mesa County Engineer and Grand Junction Engineer, Grand Junction, Colorado, with Mark Pingle, Jacobs Engineering Group Inc., Pasadena, California, dated April, 1985.

Mesa County Sheriff's Department, 1985. Personal communication, Grand Junction, Colorado, to Mark Pingle, Jacobs Engineering Group Inc., Pasadena, California.

Morris, J., 1986. Colorado Division of Wildlife, Grand Junction, Colorado, personal communication with Chuck Burt, Environmental Services, Jacobs Engineering Group Inc., Albuquerque, New Mexico, dated July, 1986.

National Academy of Sciences, 1977. Guidelines for Preparing Environmental Impact Statements on Noise, Committee on Hearing Bioacoustics and Biomechanics, Working Group No. 69, Washington, D.C.

NOAA (National Oceanic and Atmospheric Administration), 1977. Climate of Colorado, National Climatic Center, Environmental Data Service, Asheville, North Carolina.

Norman, D., 1985. Association of Local Governments, Rifle, Colorado, personal communication to Mark Pingle, Jacobs Engineering Group Inc., Pasadena, California, dated May, 1985.

ORNL (Oak Ridge National Laboratory), 1980. Assessment of the Radiological Impact of the Inactive Uranium Mill Tailings at Grand Junction, Colorado, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

Planning and Assessment System, 1985. Economic and Demographic Projections, State of Colorado Division of Local Government, Department of Local Affairs, Demographic Section, Denver, Colorado.

Planning and Assessment System, 1984. Economic and Demographic Projections, State of Colorado Division of Local Government, Department of Local Affairs, Demographic Section, Denver, Colorado.

SCS (Soil Conservation Service), 1978. Soil Survey of Mesa County Area, Colorado, U.S. Department of Agriculture, Soil Conservation Service, Washington, D.C.

SHB (Sergent, Hauskins, and Beckwith), 1985a. "Geomorphic Evaluation, Grand Junction Tailings Site, Grand Junction, Colorado," prepared by Sergent, Hauskins and Beckwith, Phoenix, Arizona, for the Technical Assistance Contractor (Jacobs-Weston Team), Albuquerque, New Mexico.

SHB (Sergent, Hauskins, and Beckwith), 1985b. "Geomorphic Evaluation, Cheney Reservoir Alternate Site for Disposal of Grand Junction Uranium Mill Tailings," prepared by Sergent, Hauskins, and Beckwith, Phoenix, Arizona, for the Technical Assistance Contractor (Jacobs-Weston Team), Albuquerque, New Mexico.

SHB (Sergent, Hauskins, and Beckwith), 1985c. "Geomorphic Evaluation, Two Road Alternate Site for Disposal of Grand Junction Uranium Mill Tailings," prepared by Sergent, Hauskins, and Beckwith, Phoenix, Arizona, for the Technical Assistance Contractor (Jacobs-Weston Team), Albuquerque, New Mexico.

SHB (Sergent, Hauskins, and Beckwith), 1985d. "Seismic Risk Evaluation," prepared by Sergent, Hauskins, and Beckwith, Phoenix, Arizona, for the Technical Assistance Contractor (Jacobs-Weston Team), Albuquerque, New Mexico.

Schearer, S.D. Jr., and C.W. Sills, 1969. Evaluation of Radon-222 Near Uranium Piles, HEW DER 69-1, March, 1969.

Schumm, S.A., and M.D. Harvey, 1983. Geomorphic Evaluation of the Grand Junction and Rifle Uranium Mill Tailings Piles, prepared by Waste Engineering and Technology, Inc., Fort Collins, Colorado.

Schwochow, S.D., 1978. "Mineral Resources Survey of Mesa County-A Model Study," Colorado Geological Survey, Denver, Colorado.

Shleien, B. and M.S. Terpilak, 1984. The Health Physics and Radiological and Health Handbook, Nuclear Lecterm Associates, Inc., Olmey, Maryland.

Smith, L., 1985. Statistical Analyst, Colorado State Patrol, Denver, Colorado, personal communication to Mark Pingle, Jacobs Engineering Group Inc., Pasadena, California, dated May, 1985.

State of Utah, 1938. Underground Water Claim No. 16418, PDC Center File #5.19.2.5, available from UMTRA Project Document Control Center, U.S. Department of Energy, Albuquerque, New Mexico.

Trainor, C., 1985. Transportation Planner, Mesa County Policy and Research Office, Grand Junction, Colorado, personal communication to Mark Pingle, Jacobs Engineering Group Inc., Pasadena, California, dated May, 1985.

URS (URS Corporation), 1983. Salinity Investigation of the Glenwood-Dotsero Springs Unit, prepared by URS Corporation, Denver, Colorado, for the U.S. Department of the Interior, Bureau of Reclamation, Grand Junction, Colorado.

USFWS (U.S. Fish and Wildlife Service), 1985. Written communication from R. Garrison, Acting Field Supervisor, Salt Lake City, Utah, to R. Peel, Jacobs Engineering Group Inc., Albuquerque, New Mexico, dated March 28, 1985.

USFWS (U.S. Fish and Wildlife Service), 1984. Letter from F. Bolwahnn, Fish and Wildlife Service, Grand Junction, Colorado, to D. Lechel, the Technical Assistance Contractor (Jacobs-Weston Team), Albuquerque, New Mexico.

USFWS (U.S. Fish and Wildlife Service), 1983. Letter to A.R. Grainger, NUS Corporation, Aurora, Colorado, February, 1983, 4 p.

USFWS (U.S. Fish and Wildlife Service), 1978. An Illustrated Guide to the Proposed Threatened and Endangered Plant Species in Colorado, U.S. Fish and Wildlife Service, Lakewood, Colorado, 114 p.

U.S. Bureau of Labor Statistics, 1985. Personal communication with regional office, Los Angeles, California, to Mark Pingle, Jacobs Engineering Group Inc., Pasadena, California, April, 1985.

U.S. Bureau of Reclamation, 1978. Appendix B to Stage One Development, Grand Valley Unit, Definite Plan Report, Colorado River Basin Salinity Control Project.

U.S. Bureau of Reclamation, no date. "Miscellaneous Unpublished Data," Colorado River Quality Improvement Program, PDC Center File #5.19.2.5, available from UMTRA Project Document Control Center, U.S. Department of Energy, Albuquerque, New Mexico.

U.S. Department of Commerce, 1985a. Local Area Personal Income 1978-1983: Volume 8, Rocky Mountain Region, Bureau of Economic Analysis, Washington, D.C.

U.S. Department of Commerce, 1985b. Population estimates for Colorado Counties, July 1, 1983 by Telephone, U.S. Bureau of the Census, Los Angeles, California.

U.S. Department of Commerce, 1984a. 1982 Census of Governments; Compendium of Government Finances, U.S. Bureau of the Census, Washington, D.C.

U.S. Department of Commerce, 1984b. 1982 Census of Governments: Finances of Municipal and Township Governments, U.S. Bureau of the Census, Washington, D.C.

U.S. Department of Commerce, 1982a. 1980 Census of the Population, General Population Characteristics - Colorado, U.S. Bureau of the Census, Washington, D.C.

U.S. Department of Commerce, 1982b. Local Area Personal Income, 1975-1980: Volume 8, Rocky Mountain Region, Bureau of Economic Analysis, Washington, D.C.

U.S. Department of Commerce, 1981. Characteristics of the Population, General Population Characteristics, Colorado, PC80-1-87, U.S. Bureau of the Census, Washington, D.C.

U.S. Department of Commerce, 1971. 1970 Census of the Population, General Population Characteristics - Colorado, U.S. Bureau of the Census, Washington, D.C.

U.S. Department of Health and Human Services, 1981. Health, United States - 1981, Washington, D.C.

U.S. Department of Transportation, 1982. Accident/Incident Bulletin No. 150, Calendar Year 1981, Federal Railroad Administration, Office of Safety, Washington, D.C.

U.S. Department of Transportation, 1981. Guidelines for Selecting Preferred Highway Routes for Large Quantity Shipments of Radioactive Materials, Washington, D.C.

Valdez et al. (R. Valdez, P. Mangan, R. Smith, and B. Nilson), 1982. "Upper Colorado River Investigation (Rifle, Colorado to Lake Powell, Utah)," Colorado River Fishery Project, U.S. Fish and Wildlife Service, Grand Junction, Colorado.

Wildesen, Leslie, 1986. Deputy State Historic Preservation Officer, Denver, Colorado, personal communication to John Themelis, U.S. Department of Energy, UMTRA Project Office, Albuquerque Operations Office, Albuquerque, New Mexico, dated September, 1986.

5.0 ENVIRONMENTAL CONSEQUENCES

The environmental consequences of the remedial action alternatives (including remedial action of the vicinity properties and potential cummulative impacts from co-disposal of GJAO wastes) are described in this chapter.

5.1 RADIOLOGICAL IMPACTS

5.1.1 Introduction

This section assesses the incremental radiological impacts resulting from each of the alternatives and indicates the methods used to perform the assessments. The data and information used to perform these impact assessments are described in greater detail in Appendix I, Radiation Health Effects. Radiation doses and health effects for both the general population within 50 miles (80 km) of the Grand Junction, Cheney Reservoir, and Two Road sites and the remedial action workers are addressed. Radiation doses and health effects along the transportation corridors are estimated for relocation alternatives.

5.1.2 Exposure pathways

There are five principal environmental pathways by which individuals could be exposed to radioactivity during remedial action (Figure 5.1). These are (1) inhalation of radon and radon daughters; (2) exposure to direct gamma radiation from the tailings pile; (3) inhalation or ingestion of windblown radioactive particulates; (4) ingestion of contaminated foods produced in areas contaminated by tailings; and (5) ingestion of ground or surface water contaminated by radioactive materials.

For the calculation of health effects, the first four pathways mentioned above are considered. Exposures via the groundwater or surface-water pathways are not considered because the water sources used for human consumption do not show evidence of contamination or the potential for contamination (Section 4.6.2).

The health effects from radon releases arise from inhaling radon daughters, the radionuclides resulting from the decay of radon. Radon is an inert gas produced from the radioactive decay of Ra-226. As a gas radon can diffuse through the tailings and into the atmosphere where it is transported by wind over large areas. In the atmosphere, radon decays into its solid daughter radionuclides which attach to airborne dust particles and may be inhaled. These dust particles with the attached radon daughters may adhere to the lining of the respiratory tract-bronchia and the lungs. The decay of the radon daughters releases radiation to the bronchia and lung tissue.

Gamma radiation is emitted by many radionuclides of the U-238 decay series. Gamma radiation is independent of atmospheric conditions and travels in a straight line until it interacts with

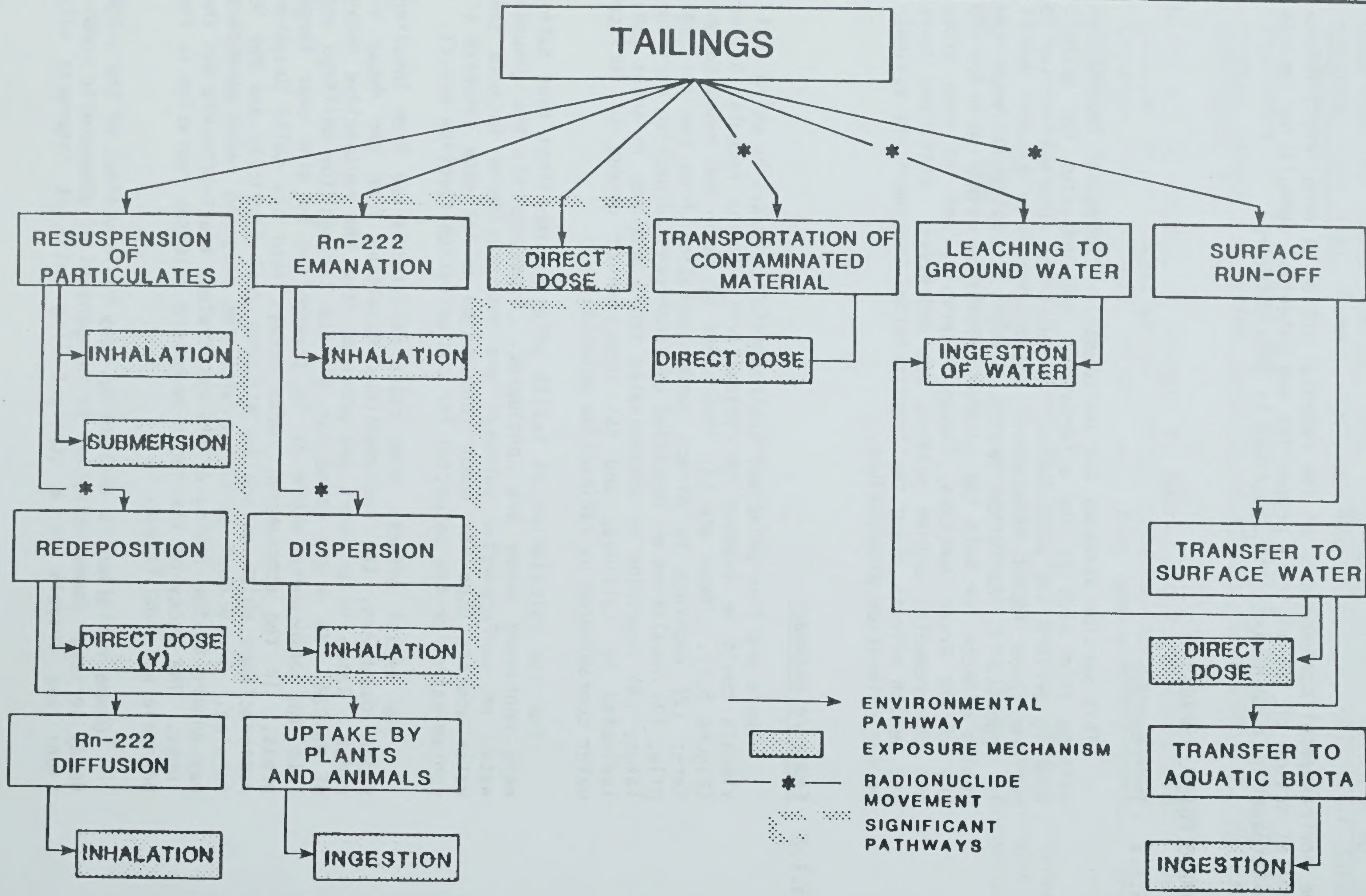


FIGURE 5.1
POTENTIAL RADIATION EXPOSURE PATHWAYS
TO THE GENERAL PUBLIC AND REMEDIAL ACTION WORKERS

matter, just as do x-rays. Gamma radiation emitted from the tailings delivers an exposure to the whole body. Gamma radiation becomes negligible due to interactions with air at about one km from the perimeter of the tailings.

Exposure to radon daughters and gamma radiation from the unstabilized tailings at the Grand Junction site currently impacts the general population and nearby workers. As remedial action is implemented, the exposures are anticipated to increase as the tailings are disturbed and transported. However, as remedial action progresses and following its completion, the exposures would be greatly reduced due to the isolation of the radioactive materials from the environment. Each alternative includes the construction of a thick earthen cover which cannot be penetrated by gamma radiation from the tailings. The thick earthen cover would also serve as a barrier to the diffusion of radon from the tailings into the atmosphere; some would escape and may produce small exposures to surrounding populations. The radon release rate through the cover would be no greater than the allowable rate set by EPA standards, as described in Appendix A, EPA Standards.

5.1.3 Methods of impact assessment

Radiation doses to the general population beyond one kilometer (km) from the site were evaluated using the computer code MILDOS (NRC, 1981). MILDOS provides estimates of the potential radiation doses to individuals in the vicinity of a typical uranium mill tailings disposal site. The input required by MILDOS includes (1) population distribution data; (2) meteorological data; and (3) radionuclide release data. The data used are discussed and presented in Appendix I, Radiation Health Effects.

The required radionuclide release data include (1) the radon emission rate from the pile surface; (2) radionuclide release rates for particulate emissions; and (3) the time periods over which the releases occur. Since the minimum time step in MILDOS is two years, some averaging of releases on shorter time scales is required.

The surface Rn-222 releases completely dominate the radionuclide emissions due to particulate sources (wind erosion and mechanical suspension of dust by earth-moving equipment); thus the population and worker radiation exposures result primarily from radon releases (Section I.5, Appendix I, Radiation Health Effects). To illustrate the magnitude of the difference between exposures resulting from radon daughters and particulate inhalation, the latter is calculated for remedial action workers for Alternative 2 and for the general population for Alternative 1.

Since MILDOS does not calculate radiation exposures within one km of the site, gamma radiation exposure was estimated for the nearby general population using measurements of gamma radiation exposure rate taken near the pile by Ford, Bacon & Davis, Utah, Inc. (FBDU, 1981). The radon concentrations in air were determined by using the Gaussian sector-average model modified to predict concentrations close to an area source.

For the tailings relocation alternatives, persons near the rail or truck transportation corridors may be exposed to gamma radiation from passing vehicles carrying radioactive materials from the Grand Junction site to the alternate sites. The time of exposure to these persons is small and radiation exposure from a vehicle is low. Calculations of these exposure rates are based on average tailings radionuclide content, vehicle speed, and the exposure rate for a vehicle.

Estimates of cancer deaths in excess of those occurring normally in a population, as caused by radiation exposure, were made using the following risk factor:

> One hundred twenty cancer deaths in the exposed population for each 1,000,000 person-rem of dose equivalent from exposure to gamma radiation (NAS, 1980; Cohen, 1981).

A wide range of risk factors are accepted by experts who attempt to relate cancer deaths to radiation exposure. DOE has selected this as a realistic value for comparison of alternatives, after reviewing figures in the literature ranging from 50 to 500 cancer deaths per 1,000,000 person-rem. For gamma radiation, the number of genetic effects is projected to be comparable to the number of cancer deaths (See Appendix I, Radiation Health Effects).

5.1.4 Radiological impacts

Estimates of the radiation dose equivalent commitments to the general population during remedial action under the alternatives are presented in Table 5.1. The potential excess cancer deaths are given in Table 5.1, as well. Table 5.2 shows the potential excess cancer deaths in the general population for 10, 100, and 1000 years after the start of remedial action. These estimates were made using the methods outlined in Section 5.1.3 and detailed in Appendix I, Radiation Health Effects. The expected excess cancer deaths were obtained from the dose equivalent commitments by multiplying by the risk factor identified in Section 5.1.3. The doses and health effects to the general population were calculated for a 50-mile radius around the Grand Junction site and the alternate disposal sites.

The health effects for the population along the transportation corridor are estimated to be 1×10^{-4} for Alternative 3; 5×10^{-6} for Alternative 4; 2×10^{-4} for Alternative 5; and 9×10^{-6} for Alternative 6. In comparison to the excess health effects shown in Table 5.1, these excess health effects are negligible.

The maximally exposed individual during remedial action would be one who resides about 200 feet from the north corner of the Grand Junction site. That person could receive an annual gamma radiation dose equivalent of about 0.22 rem in addition to about 15.8 rem dose equivalent commitment from radon daughter exposures.

Table 5.1 Estimates of excess population dose equivalent commitments to the general public within 80 km of each site during remedial action, and expected excess cancer deaths caused by remedial action (based on a 2.3-year period for Alternative 2 and a 2.7-year period for the other alternatives)[a]

Organ	Alternative 1 No action	Alternative 2 Stabilization on site	Alternative 3 Cheney Reservoir, truck	Alternative 4 Cheney Reservoir train/truck	Alternative 5 Two Road truck	Alternative 6 Two Road train/truck
			Population dose equivalent commitment (person-rem)			
Whole body	602	529	486	835	479	710
Bronchial epithelium	45,600	24,033	23,897	24,938	24,051	24,783
			Expected excess deaths			
Cancer from whole body gamma ray exposure	0.072	0.063	0.058	0.100	0.058	0.085
Lung cancer from doses to the bronchial epithelium	0.91	0.48	0.48	0.50	0.48	0.50
Total	1	0.6	0.5	0.6	0.5	0.6

[a]Does not include impacts associated with remedial action at vicinity properties. Impacts associated with remedial action at vicinity properites are addressed in Section 5.1.6.

Table 5.2 Estimates of excess cancer deaths in the general population during and after remedial action

	Expected excess deaths					
Time period (years)	Alternative 1 No action	Alternative 2 Stabilization on site	Alternative 3 Cheney Reservoir, truck	Alternative 4 Cheney Reservoir train/truck	Alternative 5 Two Road truck	Alternative 6 Two Road train/truck
10	4	0.7	0.6	0.6	0.6	0.6
100	40	2	0.7	0.7	0.8	0.8
1000	400	20	2	2	2	2

Estimates of the radiation dose equivalent commitments to the remedial action workers for each alternative are presented in Table 5.3 along with the potential resulting excess cancer deaths.

The single most important pathway to the general population and the remedial action worker is the inhalation of radon daughters and the subsequent irradiation of the tracheobronchial system. In order to put the estimated dose commitments in perspective, the estimated normal background radiation doses are presented in Table 5.4.

In the population of the U.S., about one person in six dies of cancer. This means that approximately 26,233 of the 157,397 persons who live within 50 miles of the Grand Junction site may be expected to die of cancer, regardless of the presence of the unstabilized tailings piles.

5.1.5 Radiological impacts of transportation accidents

Alternative 2 does not require off-site transportation of contaminated materials and therefore any transportation accident that would have radiological consequences would involve only remedial action workers. For remedial action workers, the consequences of an on-site transportation accident would be largely nonradiological and would not add to their exposure. Nonradiological accidents are estimated in Section 5.12.

Alternatives 3 through 6 involve the transport of 3.1 million cubic yards of contaminated material from the Grand Junction site to the alternate sites. Both train and truck transport alternatives could result in accidental spillage of material as a consequence of a transportation accident. Conceivably a loaded unit train could be derailed and overturned at some point on the route, spilling part or all of its 6200-ton load onto the railbed. Such an accident is not probable. Based on estimates of the probability of its happening during the 650 train trips required, 0.007 spills reasonably could occur during transport to the Cheney Reservoir site and 0.014 spills could reasonably occur during transport to the Two Road site. The cleanup of the roadbed would be done promptly and the several-day exposure of the cleanup crew would be small compared to the 2.7-year exposure of remedial action workers at the Grand Junction and alternate disposal sites (Sections I.4.5.1 and I.4.5.2, Appendix I, Radiation Health Effects). Notification of the spill would be made to the appropriate authorities as required under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA).

The truck option for transport to Cheney Reservoir and Two Road over 2.7 years, and the probability of an accident leading to a tailings spill, is somewhat greater than for train transport; about three spills reasonably could occur during transport to Cheney Reservoir and five spills could reasonably occur during transport to Two Road during the 2.7 years of remedial action. Based on experience to date at the Salt Lake City site, 75,000 cy of tailings have been moved by about 5000 trucks and only one accident has occurred. No injuries or deaths resulted. In the

Table 5.3 Estimates of excess collective dose equivalent commitments to the remedial action workers and expected excess cancer deaths caused by remedial action

Organ	Alternative 1 No action	Alternative 2 Stabilization on site	Alternative 3 Cheney Reservoir, truck	Alternative 4 Cheney Reservoir train/truck	Alternative 5 Two Road truck	Alternative 6 Two Road train/truck
		Population dose equivalent commitment (person-rem)				
Whole body	0	374	701	703	678	717
Bronchial epithelium	0	3597	6225	5422	6189	5758
		Expected excess deaths				
Cancer from whole body gamma ray exposure	0	0.049	0.084	0.084	0.081	0.086
Lung cancer from doses to the bronchial epithelium	0	0.072	0.125	0.11	0.12	0.12
Total	0	0.1	0.2	0.2	0.2	0.2

event of an accident, the radiological consequences would be minimal considering the limited quantity of contaminated material involved and the short period of time that would be required for a cleanup (a day or less). Again, the exposures are small compared to that of the remedial action workers at the Grand Junction and alternate disposal sites (Sections I.4.5.1 and I.4.5.2, Appendix I, Radiation Health Effects).

Table 5.4 Background radiological levels

Parameter	Background dose per individual (mrem/yr)	Population dose equivalent[a] (person-rem/yr)
Background[b] external whole-body dose	105	16,530
Bronchial dose[c] from ambient radon	1550	243,900
Total	1655	260,480

[a]Based on the 157,397 persons living within 50 miles of the Grand Junction site.
[b]Based on a background exposure rate of 12 uR/hr.
[c]Based on a background radon concentration of 0.8 pCi/l.

5.1.6 Radiological impacts at vicinity properties

Inhalation of radon daughter products and direct exposure to gamma radiation are the exposure pathways considered at vicinity properties. Increases in particulate concentrations are expected; however, the dose to individuals caused by this pathway would be very small when compared to radon daughter inhalation and direct gamma exposure. The excess health effects summarized below are conservative. This is because the gamma exposure rate used for the health effects calculation is the average of the highest indoor and outdoor gamma exposure, and the exposure period at all vicinity properties is assumed to be 24 hours per day.

The estimated number of excess health effects resulting from the contamination at vicinity properties among the general public from whole-body gamma exposure is 0.51 cancer deaths. A total of 0.84 lung cancer deaths are estimated as a result of radon daughter inhalation.

The estimated number of excess health effects due to whole-body gamma exposure among remedial action workers is 0.021 cancer deaths. A total of 0.023 lung cancer deaths are estimated as a result of radon daughter inhalation.

Under the no action alternative, remedial action would not be performed at the vicinity properties so there would be no excess health effects for remedial action workers. However, the radiation doses to the general population would continue at the present levels and would result in one excess cancer death per year.

5.2 IMPACTS ON AIR QUALITY

5.2.1 Sources of air pollutants

The following is a summary of the air quality impact studies performed for this EIS:

- Total air pollutant emissions were calculated for each alternative. The details of these calculations are given in Appendix D, Weather, Air Quality, and Noise.

- For each alternative, dust emissions from the operation of equipment, including the loading of trucks, truck hauling, truck dumping, and equipment operation, were calculated. Fugitive dust emission factors developed by the Colorado Department of Health (1981) were used.

- Wind erosion of tailings and other materials was estimated for each alternative. A version of the universal soil-loss equation recommended by the Colorado Department of Health (1981) was used to make these calculations. Emissions were assumed to be constant for each month.

- For each alternative, exhaust emissions were calculated for construction equipment, trucks, and locomotives.

Emission rates for construction equipment and off-road trucks were calculated from the emission factors recommended by the EPA (1982) for diesel-fueled construction equipment. Emission rates for on-road trucks were calculated from high-altitude emission factors developed by the EPA (EPA, 1979). Locomotive emissions were calculated from emission factors for locomotives (EPA, 1982) and the estimated fuel-usage rate at Grand Junction and along train routes.

The air pollutant releases for each alternative are presented in Table 5.5. Particulates are the dominant pollutant for each alternative. The largest source of particulates along the transportation routes is the dispersal of road dust by trucks. Tailpipe-particulate emissions are a minor contributor. The particulate emissions associated with no action and disposal at the Grand Junction site are lowest. Emissions are about the same for the Cheney Reservoir with truck transport, the Cheney Reservoir with

Table 5.5 Tons of uncontrolled airborne pollutants emitted over the life of the project for each alternative

Pollutant	Site	No action[a]	Stabilization on-site	Cheney Reservoir By truck	Cheney Reservoir By train	Two Road By truck	Two Road By train
Particulates (fugitives)	Grand Junction	320	1,898	1,266	1,795	1,256	1,786
	Disposal site	---	---	1,978	1,978	1,926	1,926
	Trans. routes[b]	---	6,078	25,536	21,460	33,795	24,507
	Borrow sites[c]	---	192	---	---	17	17
	Transfer site[d]	---	---	---	1,008	---	931
	Vicinity properties	120	705	705	705	705	705
	Total	440	8,873	29,485	26,946	37,699	29,872
Exhaust particulates	Grand Junction	---	17	7	11	7	12
	Disposal site	---	---	10	11	10	11
	Trans. routes	---	5	10	7	30	11
	Total	---	22	27	29	47	34
Nitrogen oxides	Grand Junction	---	246	103	162	102	162
	Disposal site	---	---	140	148	135	145
	Trans. routes	---	52	109	87	326	143
	Total	---	298	352	397	563	450
Sulfur dioxide	Grand Junction	---	20	8	13	8	13
	Disposal site	---	---	12	13	12	13
	Trans. routes	---	10	21	16	64	25
	Total	---	30	41	42	84	51
Carbon monoxide	Grand Junction	---	62	25	38	24	37
	Disposal site	---	---	36	37	35	37
	Trans. routes	---	65	136	78	406	116
	Total	---	127	197	153	465	190

Table 5.5 Tons of uncontrolled airborne pollutants emitted over the life of the project for each alternative (concluded)

Pollutant	Site	No action	Stabilization on-site	Cheney Reservoir		Two Road	
				By truck	By train and truck	By truck	By train and truck
Hydrocarbons	Grand Junction	---	23	9	16	9	17
	Disposal site	---	---	12	13	12	13
	Trans. routes	---	10	21	19	62	32
	Total	---	33	42	48	83	62

[a] Emissions are in tons per year.
[b] Road dust from trucks.
[c] Total emissions from all borrow sites.
[d] Whitewater for Cheney Reservoir alternatives; Mack for Two Road alternatives.

train and truck transport, and the Two Road with train and truck transport alternatives. Emissions for the Two Road with truck transport alternative are the highest because of the distance that the trucks must travel.

Nitrogen oxides are the most prominent of the gaseous pollutants. The emissions of nitrogen oxides, sulfur dioxide, and hydrocarbons at the disposal sites are low, and of approximately the same magnitude as those along the transportation routes.

Carbon monoxide emissions from trucks follow the same trends as particulates; the highest emissions occur along transportation routes. There are no gaseous pollutant emissions for the no action alternative. The emissions for the Grand Junction disposal alternative are lower than those for the other four alternatives.

5.2.2 Air quality impacts

In order to assess the impacts of pollutants on air quality, the Industrial Source Complex Short Term (ISCST) dispersion model was used because it has EPA approval for the required purpose (EPA, 1983). This model allows for the modeling of multiple sources, multiple meteorological conditions, gravitational settling, and dry deposition. The ISCST model requires input data on emission rates, source locations, and meteorology. Appendix D, Weather, Air Quality, and Noise, contains additional information on these models.

Fugitive dust emissions were calculated for each alternative using formulas accepted by the EPA. Assumptions used in the emissions calculations have included reasonably available control measures, such as water spray, in accordance with the Colorado Air Quality Control Regulations. Worst-month emission rates were used in the model to predict the maximum short-term concentrations for each alternative and each site.

A rectangular grid was placed downwind of the emission sources in areas where high ambient concentrations would be expected.

Site-specific, hourly meteorological data were not available for use in the modeling analysis, therefore a simplified worst-case approach was taken. Light winds (2.5 meters per second) were assumed to blow persistently from a single direction under stable meteorological conditions (Pasquil-Gifford Category F). These meteorological conditions would produce maximum ground-level concentrations from near surface emission sources. These conditions are representative of the relatively poor dispersion typical of the late night and early morning hours. The duration of these conditions was assumed not to exceed six hours during a single 24-hour period. This approach is conservative since six consecutive hours of stable meteorological conditions during normal construction hours are very rare.

The ISCST model was also used to predict short-term air quality impacts along truck haul routes. In applying the model, conservative emissions were assumed for a 900-meter length of the road. The wind was assumed to blow perpendicular to the transportation route toward a row of receptors for six hours. The remaining hours were assumed to have no emissions. A wind speed of 2.5 meters per second and Category F stability were assumed.

The air quality modeling results are summarized in Table 5.6. Little deterioration in air quality from gaseous pollutants (sulfur dioxide, carbon monoxide, and nitrogen oxides) would occur and the concentrations would be within all applicable air quality standards when added to existing background levels.

Table 5.6 Maximum 24-hour concentrations of particulates[a] during construction (in micrograms per cubic meter)

			Cheney Reservoir		Two Road	
	No action	Grand Junction	By truck	By train	By truck	By train
Grand Junction	60	425	239	307	243	310
Disposal site	--	--	445	445	331	331
Truck transportation route	--	171	344	--	353	--

[a]The 24-hour Federal primary and secondary standards are 260 and 150 micrograms per cubic meter, respectively.

The concentrations of suspended particulates at all three disposal sites, regardless of the disposal alternative, are expected to exceed the 24-hour National and State Ambient Air Quality Standards, which are included in Section 4.4. In addition, particulate concentrations at the Grand Junction tailings site would approach or exceed standards, even under the Cheney Reservoir or Two Road alternatives. Much of the particulate impact can be attributed to wind erosion as well as construction activity. Particulate concentrations along non-paved truck haul roads are also expected to exceed standards for all of the Cheney Reservoir and Two Road alternatives. Any adverse effects of remedial action on air quality would be temporary. Also, annual concentrations of particulates would be considerably less than the worst-case 24-hour estimates. However, it is possible that the annual standard could also be exceeded under any of the alternatives (except no action).

The particulate emissions and concentrations from remedial action at vicinity properties were not modeled. Particulate emissions from the vicinity properties are expected to be very low because most of the activity would be performed with hand-held tools and small earth-moving equipment and because the average amount of material to be removed from each vicinity property (105 cubic yards) is very small. There would be very little cumulative effect between the various vicinity property sites that would be cleaned up at the same time, since the vicinity properties are widely scattered through the area.

Air quality impacts at the borrow sites were not modeled. The impacts associated with these emissions are expected to be relatively small in comparison to the impacts at the disposal sites.

Impacts at the Whitewater and Mack transfer sites for the train alternatives are expected to be small due to the high efficiency of control equipment. The unloading of the trains would be performed within a dust trapping enclosure which would trap and hold almost all particulate releases.

5.3 SOILS

5.3.1 No action

Under the no action alternative, the Grand Junction tailings pile and adjacent contaminated properties would remain as they currently exist. Continued contamination of soils adjacent to the site would occur due to dispersion by wind and water.

5.3.2 Stabilization at the Grand Junction site

Stabilization at the Grand Junction site would require the disturbance of 114 acres of soil at the processing site and 18 acres of soils on adjacent land during construction. Thirty-nine acres of these soils would be reestablished during reclamation of the site.

Borrow materials for small to medium size material would be obtained from existing commercial locations. Therefore, no new disturbance of soils would occur at these sites. The Unaweep Canyon borrow site does not have soils present although surface disturbance would occur.

5.3.3 Disposal at the Cheney Reservoir site with truck or train and truck transport

Construction activities at the Cheney Reservoir disposal site would require the disturbance of 110 acres of soil. In addition, 114 acres at the processing site and 14 acres for an access road would be disturbed under this alternative. All of the 114 acres of soil at the Grand Junction site and 30 acres of soil at the Cheney Reservoir site would be reestablished during reclamation of the site.

5.3.4 Disposal at the Two Road site with truck or train and truck transport

Under the Two Road alternatives, construction activities would disturb 80 acres at the disposal site, 114 acres at the processing site, and approximately five acres for upgrading of Two Road. All of the 114 acres of soil at the Grand Junction site would be reestablished during reclamation of the site.

Borrow materials for the radon cover would be obtained from the disposal site. Therefore, no additional disturbance of soil would occur at these sites.

5.3.5 Vicinity properties

Under all of the alternatives, except no action, an average of 0.25 acre of soils would be disturbed during remedial action at each vicinity property. An estimated 866 acres of soils would be disturbed at all of the vicinity properties combined. Following remedial action, these soils would be reestablished, as necessary, to return the sites to as near their pre-remedial action condition as possible.

5.4 MINERAL RESOURCES

5.4.1 No action

Under the no action alternative, mineral resources would not be impacted.

5.4.2 Stabilization at the Grand Junction site

Stabilization at the Grand Junction site would require 1,880,000 cy of rock, sand, and gravel from the 32 and C½ borrow site and 269,000 cy of quarried rock from the Unaweep Canyon borrow site. Since there are abundant supplies of borrow materials throughout the valley, the consumption of sand and gravel for the remedial action would have a very small impact on the region's reserves of these resources.

5.4.3 Disposal at the Cheney Reservoir site with truck or train and truck transport

The consumption of 928,000 cy of rock, gravel, and sand would result from disposal at the Cheney Reservoir site. These materials would be obtained locally from the site. The consumption of borrow materials for these alternatives would have a very small impact on the region's reserves of these resources.

Disposal at Cheney Reservoir would not necessarily preclude future oil and gas development. Public Law 95-604 requires that surface and subsurface rights at the disposal site be transferred to the Federal Government. Public Law 95-604 also authorizes the Secretary of the Interior, with the concurrence of the Secretary of Energy and the NRC, to dispose "of any subsurface mineral rights by sale or lease . . . if the Secretary of Interior takes such action as the Commission deems necessary pursuant to a license issued by the Commission to assure that the residual radioactive materials will not be disturbed by reason of any activity carried on following such disposition." However, it is unlikely that these resources would ever have a value sufficient to warrant development under the conditions that the NRC may place on development of these resources in order to ensure that the stabilized tailings are not disturbed by resource recovery operations.

5.4.4 Disposal at the Two Road site with truck or train and truck transport

Disposal at the Two Road site would consume 710,000 cy of sandy silt from the site and 222,000 cy of gravel and rock from commercial sources. The consumption of borrow materials for these alternatives would have a very small impact on the region's reserves of these resources.

The disposal of tailings at the Two Road site would not necessarily preclude development of oil, gas, and coal at the site, as discussed above for the Cheney Reservoir site.

5.4.5 Vicinity properties

Under all of the alternatives, except no action, an estimated 363,525 cubic yards of general fill (sand and gravel) would be consumed during restoration of the vicinity properties.

5.5 IMPACTS ON WATER

5.5.1 Impacts on surface water

Section 5.5.1 describes the potential surface-water impacts from each remedial action alternative and summarizes water use during each remedial action alternative. Additional details are provided in Appendix B, Engineering Designs, and Appendix F, Hydrology Report.

No action

The no action alternative would result in the continued exposure of the tailings pile to erosion from surface runoff. The present cover on the pile was not designed to provide protection against sheet and gully erosion created by severe rainfall events. Eventual erosion of the present cover would result in the transport of contaminants from the tailings pile into local surface waters.

At the present time, erosion of the tailings pile is occurring at the southeast corner of the site. The drainage ditch that separates the tailings pile from the State Repository is not armored against erosion and could cause erosion of the site during flash flooding in the area drained by the ditch.

Although at present the tailings pile is partially protected by a 30-foot berm of concrete blocks and debris, the potential for erosion during major flood events is high. The berm is subject to scour and undercutting which would cause instability of the already steep slopes. Likewise, the State Repository is not well protected from bank erosion or overbank flooding at the present time.

There is substantial evidence that channel shifts of the Colorado River have recently occurred in the Grand Junction area. Major channel migration in the area could cause further erosion at the site by directing the river against the east boundary of the site. A geomorphic analysis of the Grand Junction site and the Colorado River is included in Appendix E, Soils, Geologic, and Seismic Information.

It is apparent that under the no action alternative the potential for erosion of the tailings site is high. However, the effect of the release of contaminants into local surface water would be offset to some degree by dilution associated with large flows in the Colorado River.

Stabilization at the Grand Junction site

During remedial action, the cleanup and consolidation of the tailings and contaminated materials would result in surface disturbance, and runoff from these disturbed areas could likewise be contaminated. Also, contaminated waste water would be generated by activities such as the washing of equipment. The remedial action design includes the construction of drainage controls and evaporation ponds and installation of a waste-water treatment facility (if necessary) during site preparation to prevent the discharge of contaminated water from the site. The contaminated water would be directed to a sedimentation basin and treated prior to discharge or used as dust suppression or compaction water.

After remedial action, surface runoff created by excessive rainfall could cause erosion of the stabilized tailings pile which could result in the transport of contaminants into local surface waters unless control features are incorporated into the remedial action design. Several control features were incorporated into the remedial action design to prevent erosion of the stabilized pile and subsequent contamination of adjacent surface waters. The sideslopes of the pile would be limited to five horizontal to one vertical (20 percent), and the top of the pile would be gently sloped (maximum of four percent). These shallow slopes would promote drainage from the pile with non-erosive flow velocities.

Drainage ditches around the pile would direct surface runoff around and away from the pile. The rock erosion protection barrier placed on the top and sideslopes (two feet thick) of the pile is designed to withstand the erosive forces of severe rainfall events such as a PMP.

Due to the location of the tailings site with respect to the Colorado River, there are two design concerns related to flooding. If the pile were inundated or surrounded by floodflows, there would be a possibility for infiltration and saturation of the tailings pile with subsequent slope failure. There would also be a possibility that high flow velocities could damage the rock erosion protection barrier or cause channel shifts or localized scour that would undercut and destabilize the pile.

In order to protect the tailings from a major flood of the Colorado River, a rock armor apron, designed to withstand PMF flows, would be constructed around the entire perimeter of the pile from the highest expected water elevation to the maximum potential depth of scour. This rock armor apron would also protect the tailings pile from direct flows impinging on the pile caused by channel shifts of the Colorado River. Therefore, this alternative would have no impacts on surface water.

Disposal at the Cheney Reservoir site with truck or train and truck transport

As in the stabilization on site alternative, appropriate measures would be taken during site preparation to prevent the discharge of contaminated water during remedial action from either site under this alternative.

Likewise, the stabilized tailings pile would be constructed with 20 percent sideslopes (five horizontal to one vertical) and a maximum of four percent topslopes. A two-foot-thick layer of rock erosion protection material designed to withstand the erosive forces of severe rainfall events such as a PMP would be placed over the entire tailings pile. Drainage ditches adjacent to the pile would direct on-site flows around and away from the pile. A diversion ditch upstream of the pile would intercept flows from the drainage area above the site and direct them around the pile and into the natural drainage patterns west of the site.

After remedial action, areas of excavation on and around the Grand Junction site would be restored with uncontaminated fill to a level compatible with the surrounding terrain and graded to promote drainage. There would be no impacts to surface water under this alternative.

Disposal at the Two Road alternate disposal site with truck or train and truck transport

As in the other relocation alternative, appropriate measures would be taken during site preparation to prevent the discharge of contaminated water from either site during remedial action.

Likewise, the stabilized tailings pile would be constructed with 20 percent sideslopes (five horizontal to one vertical) and a maximum of four percent topslopes. A two-foot-thick layer of rock erosion protection material designed to withstand the erosive forces of severe rainfall events such as a PMP would be placed over the entire tailings pile. Drainage ditches adjacent to the pile would direct on-site flows and flows from the drainage area above the site away from and around the pile and into the natural drainage patterns south of the site.

After remedial action, areas of excavation on and around the Grand Junction site would be restored with uncontaminated fill to a level compatible with the surrounding terrain and graded to promote drainage. There would be no impacts to surface water under this alternative.

Borrow sites

During remedial action, appropriate drainage controls would be used at all borrow sites in order to minimize or prevent erosion and any corresponding surface-water impacts. The Unaweep Canyon borrow sites would be reclaimed according to the requirements of the BLM to facilitate proper drainage of the site. The 32 and C½ and Fruita borrow sites would not be reclaimed since they are active, private borrow sites.

Water use

Table 5.7 lists the anticipated water consumption for each remedial action alternative. Water would be used by remedial action workers for personal consumption and cleanup, watering haul roads, the compaction of the tailings and cover, and for washing equipment. Possible sources for construction water for each alternative are discussed in Appendix B, Engineering Designs.

Table 5.7 Water consumption during remedial action

Remedial action alternative	Gallons consumed (x 1000)
Stabilization on site	66,410
Cheney Reservoir truck alternative	72,548
Cheney Reservoir train and truck alternative	73,105
Two Road truck alternative	69,174
Two Road train and truck alternative	69,834

Vicinity properties

Remedial action at the vicinity properties would have a negligible effect on surface-water quality and flow patterns.

5.5.2 Impacts on ground water

In this section impacts on ground water are discussed for the various alternatives. Data and analysis supporting these discussions are contained in Appendix F, Hydrology Report.

No action

The impacts of the no action alternative can be related to the existing hydrogeologic environment near the processing site. Water quality in the alluvium would be similar to conditions in the existing environment. Key aspects of this similarity would be:

- A plume of ammonium in the alluvium extending approximately 1100 to 2600 feet west of the site at concentrations between 2.1 to 393 mg/l, relative to a maximum background concentration of 2.1 mg/l.

- A plume of uranium in the alluvium at a concentration of 80 pCi/l 3000 feet west of the site and 60 pCi/l 4000 feet west of the site. The contribution of ambient or background ground-water quality to the uranium plume is uncertain, but could range between measured background concentrations of 6.8 to 40 pCi/l.

- Plumes or sporadic distributions of downgradient, elevated concentrations of chloride, fluoride, iron, sulfate, and cadmium, and lesser contamination from arsenic, selenium, vanadium, and zinc.

The impacts of no action on potential water use in the alluvial system would vary seasonally and spatially. Very near the Colorado River, within a few hundred feet at most, background water quality can be classified seasonally as fresh to brackish (Davis and DeWiest, 1965). Farther away from the river, background water quality varies from brackish to salty. The impacts of no action on ground water would be much greater near the river than farther away from the river, and greater in some seasons than others.

In the Mancos Shale, there would be a persistence of an arsenic plume and sporadic concentrations of other contaminants. The impacts of this contamination on potential water use would be relatively minor, because the same hydrogeologic characteristics which would cause the contaminants to persist also severely restrict the potential use of the shale as a water resource, i.e., the low permeability of the shale.

A seismic risk evaluation of the Grand Junction site has concluded that the probability of active faulting near or under the site cannot be quantified. In the event of faulting, hydraulic communication between the alluvium and the Dakota Sandstone could be increased. The Dakota Sandstone is the uppermost potential bedrock aquifer. In the event of increased communication between the alluvium and the Dakota Sandstone, contaminated ground water could move down into the Dakota Sandstone. The impact of this on water use in the area would probably be relatively minor, because the Dakota Sandstone near the site already has several characteristics which limit its use (brackish quality, oil in the formation, and low yield). Additional information on seismic risk is presented in Appendix E, Soils, Geologic, and Seismic Information.

Stabilization at the Grand Junction site

Stabilization at the Grand Junction site would impact ground water near the processing site. Impacts on ground water at the processing site would include both short-term and continuing aspects. Residual impacts would be due to the existing contamination in the ground water, which would gradually be flushed from the affected ground-water system.

Sporadically distributed contamination in the upper Mancos Shale includes ammonium, arsenic, selenium, vanadium, and zinc. Because the Mancos Shale has a low permeability relative to the alluvium, these contaminants would probably be flushed relatively slowly from the shale. The persistence of these contaminants in the existing hydrogeologic setting substantiates this conclusion. The contaminants probably accumulated during active milling when concentrations of these same contaminants were high in the alluvium, and have persisted in the shale despite the flushing of the alluvium.

Long-term or continuing impacts to the shallow ground water would be due to the effects of infiltration through the stabilized tailings. Infiltrating precipitation would leach contaminants from the tailings and the leachate would contaminate the shallow ground water. A mixing cell model was used to evaluate the combined residual and long-term concentrations of uranium in shallow ground water, for the stabilization on site alternative. A detailed discussion of the model and results is presented in Appendix F, Hydrology Report.

For a relatively high infiltration rate (e.g., more highly permeable cover over the tailings), the maximum concentration of uranium in the shallow ground water would be 57 to 343 pCi/l 10 years after remedial action, 39 to 253 pCi/l 25 years after remedial action, and would stabilize near 39 to 235 pCi/l after approximately 50 years. This maximum concentration represents the maximum concentration beneath the tailings, while concentrations downgradient (i.e., west) of the tailings would be less. For a relatively lower infiltration rate (e.g., less permeable cover), uranium concentrations in the shallow ground water would be 13 to 292 pCi/l 10 years after remedial action, 8.8 to 122 pCi/l 25 years after remedial action, and would stabilize near 8.8 to 52 pCi/l after approximately 100 years. The broad range in these estimates reflects measured variability in ground-water flux amount and in background uranium concentration (which ranges from 6.8 to 40 pCi/l).

Placement of the tailings above the water table would cause a relatively large reduction in the amount of leachate generated (portions of the tailings are currently below the water table).

Although other contaminants would be present in leachate generated by infiltration, the reduction in leachate volume means that long-term impacts would be primarily due to uranium. This conclusion is substantiated by the fact that uranium is one of only two constituents which exhibit a definite plume in the existing alluvial system. In the short term, concentrations of ammonium and uranium would decline as described above for uranium. Other short-term impacts would be the presence of sporadically distributed constituents of ground water other than uranium and ammonium. The presence and concentration of these other constituents is discussed in Section 4.0, Affected Environment.

To predict the long-term movement of contamination, solute transport calibrations and simulations were conducted for ammonium, arsenic, chloride, and uranium in the alluvial ground-water system. Solute transport was simulated with an analytical equation presented in Javandel et al., 1984, page 19.

Two simulations were performed for each constituent based on calibrations. In one simulation, it was assumed that the source would continue to decay at the same rate as in the calibration. This is a no action scenario. In the other simulation, it was assumed that the source would decay from its present concentration to background during a three-year remedial action. This scenario predicts lower concentrations than may be expected because residual contamination is not taken into account. The likely occurrence would be somewhere between these two predictions.

These analyses indicate the following:

- o Levels of the four constituents generated during remedial action should be minor.
- o Arsenic is presently, and even with no action should remain, well below drinking water standards.
- o Ammonium may persist in the ground water for several hundred years at elevated concentrations. No State of Colorado or Federal water quality standard is applicable.
- o Uranium may persist in the shallow ground water for up to 150 years. No State of Colorado or Federal ground-water standard is associated with uranium.

- o Due to retardation of these constituents, particularly ammonium, natural restoration or artificial restoration would be exceedingly time consuming.
- o The movement of other elevated constituents which are cations such as iron, manganese, and nickel also will be retarded.
- o The present level of chloride at the Dakota Sandstone subcrop is the maximum expected concentration and the chloride concentration should decline rapidly in the next 20 to 30 years.

Supporting data and analyses are in section F.3.2.2 of Appendix F, Hydrology Report.

The impacts of stabilization at the Grand Junction site on potential water use in the alluvial system would occur mostly in a limited area near the Colorado River where water quality is better than away from the river. Elevated concentrations of uranium would tend to restrict use of this water or cause hazards associated with its use. Section 5.1.5 discusses radiation impacts on consuming ground water near the Grand Junction site. Potential use of the alluvial ground water would be small due to the poor background quality of the water and the ready availability of good quality city water in the area.

As stated above in the discussion of the no-action alternative, an unquantified risk of faulting at the site represents a potential means of contaminating the Dakota Sandstone. In the short term (e.g., zero to 75 years after remedial action), the impacts of faulting on water quality for the stabilization on site alternative would be quite similar to the impacts of no action. In the long term (e.g., >75 years after remedial action), the impacts of faulting would be relatively minor because expected long-term concentrations of contaminants in the ground water are expected to be small.

Water quality at the borrow sites is probably typical of shallow water quality throughout the Grand Valley, ranging from fresh to brackish. Borrow activities would not include any aspects which could greatly degrade ground-water quality.

<u>Aquifer restoration</u>

Decisions on aquifer restoration are guided by several factors including the technical feasibility of improving the aquifer in its hydrogeologic setting, the cost of applicable restorative or protective programs, the present and future value of the aquifer as a water resource, the availability of alternative water supplies, and the degree to which human exposure is likely to occur. Using these factors as guides, it would not be necessary to institute an aquifer restoration program because:

- It would be technically difficult to restore the aquifer; recharge from the adjacent river would hamper the efficiency of any scheme to capture contaminated ground water.

- The present and future value of the aquifer is limited by its generally brackish quality, and on a qualitative basis can be deemed to be low.

- The cost of restorative programs would be relatively high, compared to the value of the ground water.

- Alternative water supplies are readily available. A good quality municipal water supply system is present in the affected area.

- The degree of human exposure is likely to be relatively small, because the likelihood of use of the affected ground water is small.

Regardless, when EPA issues revisions to the water protection standards, DOE will re-evaluate the ground-water issues at the site to assure that the revised standards are met. Performing remedial actions to stabilize the tailings prior to EPA issuing new standards will not affect the measures that are ultimately required to meet the revised water protection EPA standards.

Additional detail regarding the evaluation of the need for aquifer restoration is presented in Appendix F, Hydrology Report.

Relocation of the tailings

Relocation of the tailings to any alternate site would reduce long-term ground-water contamination at the processing site. There would, however, be some persistent residual contamination. A mixing cell model was used to evaluate the persistence of dissolved uranium in the shallow ground water (see Appendix F, Hydrology Report). Maximum residual concentrations of uranium were estimated at 40 to 285 pCi/l 10 years after remedial action, 20 to 102 pCi/l 25 years after remedial action, 8 to 41 pCi/l at 50 years after remedial action, and 6.8 to 40 pCi/l at 100 years after remedial action. For these estimates background quality was assumed to be within the measured range of 6.8 to 40 pCi/l.

Ammonium is the only other constituent which has a definite plume in the alluvial ground water. Ammonium and other contaminants which occur sporadically in the alluvium would be flushed rapidly from the system, when considered with respect to hazardous levels of these constituents. Uranium would represent the most persistent impact to the quality and potential use of the alluvial system.

Elevated levels of various constituents would probably persist in the shallow Mancos Shale for a longer period than uranium would persist in the alluvium. The impact of these contaminants should be judged with respect to the potential use of the shale, which is minimal due to the poor background quality and low yield of the shale. The reason for the low yield of the shale is the same as the reason for the persistence of contamination in it.

Disposal at the Cheney Reservoir site with truck or train and truck transport

Relocation of the tailings to the Cheney Reservoir site would cause impacts to ground water at the processing site, at the borrow sites, and at the alternate disposal site. The impacts at the processing site (shown above) would be approximately the same for relocation to either of the two alternate sites.

Impacts to ground water at the Cheney Reservoir site would be due to leachate produced as infiltration passed through the tailings and into the shallow zone of saturation. In the existing environment at the site, water quality degrades from fresh to brackish in a short distance because of contact between the water and the Mancos Shale. The leachate would probably contribute to the total dissolved solids (TDS) in the shallow ground water, and would provide a source of contaminants which are not currently present in the ground water at concentrations more than a few times the lower limit of detection. These contaminants would probably include aluminum, ammonium, arsenic, cadmium, manganese, molybdenum, nickel, selenium, uranium, vanadium, and zinc.

The amount of leachate would be small due to the placement of a low-permeability soil cover over the tailings. The clayey layer placed below the tailings would attenuate the contaminants. Appendix B, Engineering Designs, provides additional detail on ground-water protection. The shallow ground water below the site moves at a slow rate of 0.6 to 8.7 feet per year.

There is no known existing use of shallow ground water in the vicinity of the site. In order to evaluate the impacts on water use, the potential use of ground water at the site was evaluated. One constraint on the potential use is the limited yield of the system. The low permeability and thin saturated section of the shallow system would limit its long-term steady yield to less than three gallons per day. The amount of leachate would be small due to the placement of a low-permeability soil cover over the tailings. Good quality water is hauled into the area for use at the closest residences about 1.5 miles away. The brackish quality and low yield of the shallow ground-water system, combined with the proven availability of good quality water from an alternative source, indicate a low potential for use of the shallow ground water. Thus the impacts on potential ground-water use would be minimal.

Disposal at the Two Road site with truck or train and truck transport

Relocation of the tailings to the Two Road site would cause impacts to ground water at the processing site, at the borrow sites, and at the alternate disposal site. The impacts at the processing site would be approximately the same for relocation to either of the two alternate sites; these impacts are discussed above. The impacts at the borrow sites would be similar to the impacts on borrow sites for the stabilization on site alternative (see above).

There is no continuous shallow ground water at the Two Road site or ground-water use within four miles of the site, so there is no ground water to be impacted. Infiltration would generate leachate; however, during a 1000-year design life the amount generated would have a relatively low potential for creating off-site impacts because of the lack of a continuous ground-water system or nearby use. There is no recorded use of ground water within four miles of the site, probably due to the poor quality of ground water in the area.

Vicinity properties

Remedial action at vicinity properties would not affect any ground-water resources.

5.6 IMPACTS ON ECOSYSTEMS

Terrestrial, riparian, and aquatic ecosystems would be impacted directly and indirectly by remedial actions. Direct impacts result from the clearing of contaminated soils, disposal of tailings, widening of haul roads, and from obtaining borrow material. Indirect impacts include noise, dust, and other human activities at, and adjacent to, the direct impact areas. Direct impacts can either be long-term or short-term while most indirect impacts are short-term (for the life of the project). This section addresses the impacts for each alternative on the terrestrial ecosystems, riparian and aquatic ecosystems, and threatened and endangered species.

5.6.1 Impacts on terrestrial ecosystems

The no action alternative would cause no impacts on the terrestrial ecosystems.

Stabilization at the Grand Junction site

Stabilization at the Grand Junction site would impact 227 acres (Table 5.8). The majority of this 227-acre area (132 acres) is highly disturbed land at or near the tailings pile. The vegetation and wildlife that exist at this site are sparse and stabilization of the contaminated material in place would result in minor habitat loss. Indirect impacts on wildlife resulting from human activity would be minimal on the east, west, and north sides of the pile due to the urban nature of this area. Indirect impacts to the riparian zone south of the pile would be greater due to the

Table 5.8 Number of acres of land affected by remedial action

Land unit	Number of acres		
	Stabilization in place	Stabilization at Cheney Reservoir	Stabilization at Two Road
Tailings pile and other contaminated land	114	114	114
Riparian zone[a]	< 1	< 1	< 1
Land adjacent to processing site	18	--	--
Cheney Reservoir	--	110	--
Two Road	--	--	80
Fruita borrow	--	--	10
32 and C½ borrow	70	--	--
Unaweep Canyon	25	--	--
Access roads	--	14	5
Total	227	238	209

[a]Approximately 0.2 acre of riparian habitat would be affected directly by remedial action.

relatively high wildlife value of this habitat. These indirect impacts include increased fugitive dust emissions, elevated noise levels, and the increased presence of humans. The effects of fugitive dust include reduced palatability of vegetation for wildlife and physiological stress on plants. The effect of noise on wildlife varies from direct effects on hearing to indirect effects such as masking (the inability to hear important environmental cues) and loss of usable habitat. The effects of noise can be compounded by the presence of humans and the impact of noise and human presence is often hard to separate (Dufour, 1980). The impact of noise on wildlife is poorly understood but many species of wildlife seem to be able to adjust to relatively constant noise levels of up to 70 decibels (Dufour, 1980). Noise levels of this magnitude or greater can be expected to occur in the riparian zone.

A total of 93 acres of this 132-acre area represents a long-term loss in habitat in that it would not be revegetated following remedial action. Instead, it would be covered with rock, and vegetation growth would be discouraged. The remaining 38 acres would be rehabilitated following remedial action and would become wildlife habitat.

<u>Unaweep Canyon borrow site</u>

A total of 25 acres would be affected at the Unaweep Canyon borrow site. As noted in Section 4.7.2, the exact location of this area has not been determined. The habitat lost would be low-density grasses and pinon pines typical of rocky slopes.

Other potential impacts at Unaweep Canyon involve threatened and endangered species (discussed in Section 5.6.3) and big game critical wintering areas. Remedial action related impacts on mule deer and elk wintering in Unaweep Canyon include (1) direct loss of habitat; (2) indirect loss of habitat through increased human activity; and (3) direct mortality due to project-related truck traffic.

Direct habitat loss would amount to about 25 acres of the rock quarry. This impact would be short-term in that the borrow area would be reclaimed following remedial action and converted to wildlife habitat.

Indirect impacts related to human activity would be from a zone of noise, dust, and other disturbances extending out from the borrow area plus a disturbance zone along Highway 141 as a result of truck traffic. The disturbance around the borrow area may limit deer and elk use of a zone extending out 0.5 mile. Indirect disturbance related to increased truck traffic on Highway 141 is expected to be minimal because deer and elk are presently adapted to a steady stream of traffic along Highway 141. These indirect impacts are short-term in that they would occur during remedial action.

Truck traffic would pass through about 15 miles of deer and elk critical winter habitat along Highway 141 in Unaweep Canyon.

There would be an average 51 truck trips per day for 60 months and 33 per day for 30 months. The winter concentration period for deer and elk is from December through April and an increase in deer and elk highway mortality due to truck traffic would be expected. Deer and elk occur at higher elevations during the remainder of the year and highway mortality would be much reduced. This direct impact would be short-term lasting for the duration of the remedial action.

<u>Disposal at the Cheney Reservoir site with truck or train and truck transport</u>

Stabilization at Cheney Reservoir would impact about 238 acres (see Table 5.8). Much of this area (114 acres) is the highly disturbed habitat at the tailings pile. The direct and indirect impacts on terrestrial habitat for this area are the same as described under "Stabilization at the Grand Junction Site" above. The impacts at the tailings pile would be short-term in that the area would be revegetated following removal of the contaminated material.

At the Cheney Reservoir site, 80 acres of habitat would be impacted. The area of the stabilized pile would be 62 acres and represents the long-term loss of wildlife habitat. The remaining 18 acres would be reclaimed and serve as wildlife habitat. The analysis of the existing environment at Cheney Reservoir indicated that critical habitat for economically important species or threatened and endangered species does not occur on the site. Wildlife losses associated with this alternative would be proportional to habitat eliminated and represent an unavoidable adverse impact. This includes the long-term loss of approximately 62 acres of pronghorn habitat.

Fourteen acres of habitat would be permanently lost through access road widening. Increased traffic along this little used road (209 one-way trips per day) would have the same potential truck transport impacts as described for Unaweep Canyon plus the impact of increases in fugitive dust. Increases in big game traffic mortality are expected to be minimal as the pronghorn antelope and mule deer are widely and sparsely distributed throughout this area and the road does not traverse critical winter range. Fugitive dust may have an adverse impact on roadside vegetation up to 1200 feet from the road. This, along with increased truck traffic, would be expected to lower wildlife use near the road for the duration of the project.

<u>Disposal at the Two Road site with truck or train and truck transport</u>

Stabilization at the Two Road site would impact about 209 acres (see Table 5.8). Impacts associated with the tailings pile (114 acres) are the same as those described for disposal at Cheney Reservoir. A total of 80 acres would be disturbed at the disposal site. The stabilized pile would cover 62 acres and represents a long-term loss of wildlife habitat. The remaining 18 acres would be reclaimed as wildlife habitat. The analysis of the existing environment revealed that critical habitat for economically important species or threatened and endangered species does not occur on the site although there would be a loss in pronghorn habitat. The prairie dog is very common at this site and assuming there are five prairie dogs per acre, remedial action activities would eliminate or displace about 400 individuals.

About five acres of land would be impacted due to the widening of an access road. The impacts of 239 truck trips per day on this section of road would be similar to those for disposal at Cheney Reservoir except lower in magnitude due to the shorter stretch of road.

Vegetation and wildlife losses associated with this alternative represent an unavoidable adverse impact.

Vicinity properties

Remedial action at the vicinity properties would result in the temporary loss of an average of 0.25 acre of landscape vegetation at each of the vicinity properties. This temporary loss of habitat would result in the temporary displacement of wildlife which typically occurs in urban environments.

5.6.2 Impacts on aquatic and riparian ecosystems

The no action alternative would cause no new impacts on the aquatic and riparian ecosystems.

Stabilization at the Grand Junction site

Remedial action activities in this riparian zone will be limited to the decontamination of the 400- to 600- square-foot area on Watson Island (Figure G.3.1, Appendix G, Floodplains and Wetlands Assessment). This activity would have very little impact on the riparian vegetation since the equipment necessary to perform the job will traverse an existing bridge to Watson Island and existing roads on the island. In addition, the contaminated area is located in a highly disturbed section of Waston Island having been cleared of trees, and piled with rubble and slash. This activity will have very little or no impact on the small side channel of the Colorado River situated near the area of contamination.

Disposal at the Cheney Reservoir site with truck or train and truck transport

The impacts of this alternative on the aquatic and riparian ecosystem would be the same as stabilization at the Grand Junction site.

Disposal at the Two Road site with truck or train and truck transport

The impacts of this alternative on the aquatic and riparian ecosystems would be same as for stabilization at the Grand Junction site.

5.6.3 Impacts on threatened and endangered species

The no action alternative would cause no impacts on threatened and endangered species.

Stabilization at the Grand Junction site

As noted in Section 4.7.4, the USFWS and the State of Colorado have identified several fishes as endangered or threatened that potentially occur in small numbers in the Colorado River near the Grand Junction site. A biological assessment was prepared by the DOE (DOE, 1983a) and the USFWS responded with a biological opinion of "no effect." This issue is being readdressed with USFWS because of the recently identified need for remedial action in the riparian zone. As noted in the revised biological assessment (DOE, 1986), remedial action activities in the riparian zone would have only a negligible impact in this area and would not impact endangered or threatened fish species or their use of the river.

The bald eagle is known to winter in small numbers along the Colorado River near Grand Junction and an occasional bird may use the riparian habitat that would be cleared. The bald eagle use of this area is expected to be minimal and sporadic and important habitat features such as diurnal perches or nocturnal roosts are not known to occur in the area to be affected.

The spineless hedgehog cactus, bald eagle, peregrine falcon, and nakomis fritillary butterfly all may occur at various locations and during various seasons in Unaweep Canyon. A borrow site in Unaweep Canyon would be constructed only if the stabilization on site alternative is implemented. DOE would consult with the BLM and USFWS during the selection of the exact location of the 25-acre borrow site to prevent any substantive impact on any of these species. DOE would make every reasonable effort to select a site where none of these species occur. If the selection of the borrow site would affect any of these species, DOE would prepare and implement a mitigation plan in consultation with the BLM and USFWS to offset these impacts; however, no substantive impacts are expected. Following remedial action the site would be reclaimed according to the requirements of BLM.

Disposal at the Cheney Reservoir site with truck or train and truck transport

The potential impacts of remedial action on bald eagle use of the riparian habitat are the same as those reported for stabilization at the Grand Junction site as discussed above. Analysis of the existing environment at the Cheney Reservoir site indicated that the whooping crane was the only species which may be found in the area. This species has the potential of using Cheney Reservoir during migration. As indicated in the Biological Assessment for the Cheney Reservoir site (DOE, 1983b) and concurred in by the USFWS (Bolwahnn, 1983), remedial action at this site is not expected to impact the whooping crane.

Prairie dog towns do occur at and near the Cheney Reservoir site. Additional surveys of these towns will be performed if this site is ultimately selected. If the prairie dog town is of sufficient size, a black-footed ferret survey would be conducted within one year prior to the start of remedial action.

Disposal at the Two Road site with truck or train and truck transport

The potential impacts of remedial action on bald eagle use of the riparian habitat are the same as those reported for stabilization at the Grand Junction site. Analysis of the existing environment at the Two Road site indicates that no threatened or endangered species occur there. However, if selected as the ultimate site, black-footed ferret surveys would be conducted prior to remedial action.

Vicinity properties

Remedial action at the vicinity properties would not impact any threatened or endangered species.

5.7 IMPACTS ON LAND USE

5.7.1 No action

The no action alternative would preclude the 114 acres comprising the Grand Junction site from any alternative land use. In addition, wind and water erosion of the tailings would continuously expand the area which is not safe for human use. The Parks and Recreation Plan of the City of Grand Junction, which designated the land area occupied by the site as part of the proposed Colorado River Park System, would need to be modified to exclude the 114 acres. Industrial development, which is the primary land use in the vicinity of the site, would also be affected; however, because there is an abundance of available industrial zoned land in the area, the impact would be slight.

Current land values for large parcels of industrial land in Grand Junction range from approximately $0.25 per square foot to $1.00 per square foot (Razga, 1984). Applying these values to the 114 acres of the Grand Junction site, the estimated value of the parcel, free of contaminated materials and available for development, would range between $1.3 million and $5.0 million. However, because the site is within the 100-year floodplain, the value of the parcel may be below even the $1.3 million estimate. Mesa County discourages development in the floodplain, while the city of Grand Junction, if it issued a Floodplain Development Permit, would require costly special construction to meet floodplain regulations. The parcel without the contaminated material removed is of little market value, since the cost of removing the tailings would have to be incurred before any development would be possible. The no action alternative would have no impact on land values of parcels surrounding the site.

5.7.2 Stabilization at the Grand Junction site

Stabilization of the tailings pile at the Grand Junction site would preclude 93 acres from any alternative land use. The land occupied by the stabilized tailings pile would not be usable as designated by the city of Grand Junction for part of the proposed Colorado River Park System. It would also be unavailable for industrial use; however, this impact should be slight given the abundance of land available for industrial development in the area.

The 93 acres, free of contaminated materials, would be valued at approximately $1.0 million if the low price in the range of prices for Grand Junction industrial land per square foot ($0.25/sq ft) is applied. This value may be high due to the site's location in the 100-year floodplain. The stabilization of the tailings on the site could positively affect the values of land parcels in close proximity to the site; however, given the abundance of buildable land in Grand Junction and because the presence of the unstabilized tailings pile apparently has had little effect on land values, any such positive effects would likely be slight.

A total of 132 acres would be disturbed at the Grand Junction site during the construction period. The total includes the 114 acres of the processing site and an additional 18 acres which would have to be purchased. The 18 acres purchased would become part of the 93 acres making up the acreage permanently occupied by the stabilized pile.

The excavation of borrow materials would disturb approximately 25 acres at the Unaweep Canyon borrow site and 70 acres at the 32 and C½ borrow site. The Unaweep Canyon borrow site is in a remote location, while the 32 and C½ borrow site consists of existing privately owned gravel pits; thus, temporary and permanent impacts at borrow sites would be minimal.

Disposal at the Grand Junction site would have only a negligible impact or no impact on existing or future agricultural resources.

5.7.3 Disposal at the Cheney Reservoir site with truck or train and truck transport

Disposal of the tailings at the Cheney Reservoir site would permanently remove approximately 62 acres of rangeland from the BLM Kannah Creek allotment. The acreage occupied by the stabilized pile would be unavailable for oil and gas exploration although exploration activities for these resources could be conducted from adjacent areas (Section 5.4). A stabilized tailings pile at the site, which is surrounded by Federally owned land, would have no impact on the surrounding land values. Disposal at the Cheney Reservoir site would make the 114-acre Grand Junction site available for further development.

During the construction period, a total of 110 acres would be disturbed at the Cheney Reservoir site. Of this total, the 62-acre tailings pile would be permanently removed from public use while the remaining 48 acres would be temporarily disturbed; 30 acres for borrow material and 18 acres disturbed during other construction activities. An additional 14 acres of land in the vicinity of the site would be disrupted for access roads. Finally, the 114-acre Grand Junction site would be temporarily disrupted during the relocation to Cheney Reservoir.

The permanent and temporary loss of acreage at the Cheney Reservoir site would affect ranchers who are permitted to run their cattle on the Kannah Creek grazing allotment. However, considering the sparseness of the area's vegetation and the size of the range in relation to either the acreage permanently lost due to the stabilized tailings pile or the acreage temporarily lost during the construction period, the impact on affected cattle operations would be slight. The potential for agricultural development at the Cheney Reservoir site exists because of the land's favorable slope, available water, and proximity to the Kannah Creek farms. However, the BLM does not presently allow agricultural development of this land.

Disposal at Cheney Reservoir would not affect the electric power transmission lines which cross the site.

5.7.4 Disposal at the Two Road site with truck or train and truck transport

Disposal of the tailings at the Two Road site would permanently preclude 62 acres from any alternative land use. Thus, the site, which is currently under an oil and gas lease, would not be available for exploration, although exploration activities for these resources could be conducted from adjacent areas (Section 5.4). The 62 acres would be permanently removed from the BLM Bar X grazing allotment. Disposal at the Two Road site would make the 114-acre Grand Junction site available for further development.

During the construction period, 80 acres would be disturbed at the Two Road site, and five acres would be disturbed for the upgrading of access roads. An additional 10 acres at the Fruita borrow site would be temporarily disturbed. Finally, 114 acres at the Grand Junction site would be disturbed.

The permanent loss of the 62 acres used for the Two Road site would affect ranchers who run their sheep on the Bar X allotment. However, the expansive range and sparse vegetation indicate that these effects would be negligible. No effects on existing or future recreational resources in the area would occur.

Feasibility studies for the Glenwood-Dotsero project indicate that the Two Road site is the best available site for this desalinization project. However, the lack of approval of the project from the State of Colorado and the lack of Federal funding have left the feasibility of the Glenwood-Dotsero project in doubt. Selection of the Two Road site for uranium mill tailings disposal would preclude use of the site for the Glenwood-Dotsero project.

5.7.5 Vicinity properties

Long-term land use impacts would be negligible if remedial action were taken on the estimated 3465 vicinity properties (866 acres) in Grand Junction. The land uses and zoning of the affected properties would not change following the remedial action. However, approximately 70 acres of open land properties would be available for development following the cleanup work. The affected properties would be disturbed temporarily for about one month during remedial action. No mineral resources, recreational resources, or agricultural resources would be expected to be affected. Following completion of the remedial action, land values of the affected properties conceivably could be slightly enhanced, due to the improvement on the properties although there is no evidence that the existing contamination has adversely affected property values.

5.8 IMPACTS ON NOISE LEVELS

All remedial action alternatives except no action would involve the operation of heavy earth-moving and transportation equipment. This section describes the impacts of this equipment on noise levels in adjacent areas and with respect to sensitive land uses that could be adversely affected by these activities. The distribution and impacts of the noise would be different for each alternative, depending on location of sources and receptors, the types and numbers of equipment used, wind speed and direction, topography, vegetative cover, deflective surfaces, and air flows. Typical sound levels generated by the type of equipment used in the action alternatives are presented in Table 5.9. A noise prediction model (Kessler et al., 1978) was used to estimate the maximum A-weighted equivalent sound level (L_{eq}) emitted from the tailings, disposal, and borrow sites. The noise-level model is conservative (i.e., the noise levels that it predicts are probably higher than would be realized), since no attenuation for air absorption, berms, or foliage is considered in the model. Impacts on noise levels along transportation routes and due to remedial actions at vicinity properties are also considered in this section.

Table 5.9 Sound levels for equipment used at the tailings, disposal, and borrow sites

Equipment	Maximum sound level at 50 feet (dB)
D-8 bulldozer	88
Front-end loader	85
Scraper	87
Water truck	89
Haul truck	86
Compactor	87
Grader	83

Ref. Kessler et al., 1978.

5.8.1 Stabilization at the Grand Junction site

All alternatives except no action would involve excavation at the Grand Junction site. The maximum potential equivalent sound level at the Grand Junction site for the stabilization on site alternative would be approximately 95 decibels at a location 100 feet from the center of activity. This would result in maximum outdoor noise levels of approximately 74 and 73 decibels in the closest residential areas to the west and southeast of the site, respectively. These residential areas are at distances of approximately 1400 and 1500 feet, respectively. These potential noise levels would occur only during daytime hours and represent a maximum of equipment utilization. Average daytime noise levels through the duration of the project would be up to three decibels less. The alternatives involving tailings disposal at either the Cheney Reservoir or Two Road site would result in noise levels about three to four decibels lower at the Grand Junction site than stabilization on the site. However, under any of the alternatives except the no action alternative, daytime noise levels for nearby residents would be elevated more than 10 decibels above existing noise levels.

5.8.2 Alternate disposal sites

The noise levels associated with tailings disposal at the Cheney Reservoir and Two Road sites would be almost as great as for excavation and disposal at the Grand Junction site. The nearest residences that could be affected by the noise emissions at these sites are about 1.5 miles away at the Cheney Reservoir site and three miles away at the Two Road site. Noise levels from the disposal sites would probably be in the 50- to 55-decibel range at these nearest residences, even under worst-case conditions. As at the Grand Junction site, impacts would occur only during daylight hours. Daytime noise levels for the nearest residences would be elevated about 15 to 20 decibels above existing noise levels for these alternatives.

5.8.3 Vicinity properties

Most remedial action activities for vicinity properties would involve hand-held tools and the occasional use of small front-end loaders, backhoes, and dump trucks. The noise levels associated with these activities would be similar to small-scale street repair work that is common in residential areas. Typical daytime equivalent noise levels associated with these activities are expected to be in the 79- to 81-decibel range at a distance of 100 feet. Remedial action at some of the larger and more complex vicinity properties may involve larger equipment such as dozers, scrapers, large front-end loaders, and trucks. The noise levels associated with these activities are expected to be in the 87- to 89-decibel range at a distance of 100 feet. All vicinity property remedial action would occur during normal working hours and would last an average of one month per property. Therefore the noise from remedial action at vicinity properties is expected to result in short-term and minor annoyances to neighbors.

5.8.4 Borrow sites

The maximum equivalent noise levels associated with equipment activities at the 32 and C½ borrow site and at the Unaweep Canyon borrow site (for stabilization at the Grand Junction site), and at the Fruita site (for disposal at the Two Road site) would be approximately 92, 89, and 87 decibels, respectively, at a distance of 100 feet away from the centers of activity. The nearest residence to the 32 and C½ borrow site would be subjected to daytime noise levels of up to 63 decibels. The nearest residence to the Fruita borrow site would be subjected to daytime noise levels of up to approximately 66 decibels. Daytime noise levels at the residences near these borrow sites would be elevated by about 20 decibels. Noise impacts at the Unaweep Canyon borrow site would be minor because of the isolation of the sites from sensitive receptors.

5.8.5 Transportation routes

All of the proposed alternatives would involve substantial truck use on public roads and highways. Table 5.10 presents data on existing noise levels and projected truck usage for route segments receiving substantial use for extended periods of time (as discussed in the transportation impacts section of this document). Trucks can be expected to produce noise levels of approximately

Table 5.10 Existing noise levels, project truck pass-by, and noise increases for selected route segments

Alternative/segment	Existing daily traffic (vehicles)	Existing noise levels[a]	Truck pass-by with up to 79 dB[b] at 100 feet	Increase in noise levels[a]
Stabilization on site				
D Road (15th St to 32 Rd)	3,700-6,900	55-60	74 per/hour	2
Cheney-truck				
D Road (15th St to 32 Rd)	3,700-6,900	55-60	26 per/hour	1
U.S. 50 (N of 32 Rd)	4,600-21,500	60-70	26 per/hour	1
U.S. 50 (S of 32 Rd)	3,800-4,600	55-60	52 per/hour	2
Cheney-train and truck				
U.S. 50 (S of Whitewater)	3,800	50-60	52 per/hour	2
Two Road-truck				
Ute/Pitkin (1st St to 9th St)[c]	17,300-24,800	60-65	42 per/hour	1
I-70 and U.S. 50 (Fruita to Two Road)	1,100-3,400	50-60	49 per/hour	2
Two Road-train and truck				
U.S. 50 (Mack to Two Road)	1,110	50-55	60 per/hour	5

[a] Estimated day-night levels L_{dn} in decibels at a distance of 100 feet, based on traffic levels; Ref. Swing, 1975.

[b] Based on maximum daily projected truck trips and noise emissions of 85 decibels (dB) at 50 feet from passing trucks.

[c] Because Ute and Pitkin Avenues are one-way streets in close proximity to each other, figures for daily traffic and truck trips are combined.

79 decibels at a distance of 100 feet and up to 73 decibels at 200 feet. For the stabilization on site alternative, high levels of truck activity on D Road may cause annoyance to some residential areas. Under the Cheney Reservoir with truck transport alternative, areas along U.S. Highway 50 southeast of Grand Junction may be adversely affected. The Two Road with truck transport alternative would involve high levels of truck activity and disturbance in the downtown area of Grand Junction and along some parts of U.S. Highway 50 northwest of Grand Junction.

The rail transport alternatives would result in much lower noise emissions in Grand Junction and in the affected corridors since the trains would only travel these corridors twice a day. However, unloading operations in Whitewater or Mack and increased truck activities would result in substantially increased noise levels in Whitewater and the corridor southeast of Whitewater for the Cheney Reservoir train and truck alternative, and in Mack and the corridor northwest of Mack for the Two Road train and truck alternative.

5.9 IMPACTS ON SCENIC AND CULTURAL RESOURCES

5.9.1 Scenic resources

No action

The no action alternative would have no impacts on scenic resources.

Stabilization at the Grand Junction site

Stabilization at the Grand Junction site would have long-term visual impacts on residents across the Colorado River from the site. The increased traffic and dust associated with the construction activities would be annoying to persons living nearby. The final height of the stabilized pile would be 55 feet above grade on the north side and 71 feet on the south side. This would be a visual annoyance to persons living nearby.

Disposal at the Cheney Reservoir site with truck or train and truck transport

Disposal at the Cheney Reservoir site would cause short-term visual impacts at the Grand Junction processing site while the tailings were being removed for disposal at the alternate site. These impacts would be increased truck traffic and dust associated with the construction activities. After remedial action, the site would be graded and would blend in well with the surrounding colors and form.

The disposal of the tailings at the Cheney Reservoir site would have both short- and long-term impacts on scenic resources of the Grand Mesa National Forest. In addition, some of the residences on Purdy Mesa would be impacted. Construction activities would be seen from established recreation areas, from many residences on Purdy Mesa, and from two residences within two miles of the site. The long-term impacts would be minimal due to the pile being part of the background landscape view from the forest and residences on Purdy Mesa. The final height of the stabilized pile would be 35 feet above grade; however, the pile would be subordinate to the regional visual characteristics and the color and form of the pile would conform with the surrounding terrain.

Disposal at the Two Road site with truck or train and truck transport

Short-term impacts would occur at the Grand Junction processing site as a result of disposal of the tailings at the Two Road site. These impacts would be increased truck traffic and dust from construction activities. After the remedial action, the site would be graded and would blend in well with the surrounding colors and form.

Disposal at the Two Road site would not have a major impact on scenic resources. The site would not be visible from any major highway. Truck traffic would cause some short-term, temporary impacts to residents along the haul route. The stabilized tailings would be 35 feet above the surrounding terrain. The pile would be subordinate to the regional visual characteristics and color and form of the pile would conform with the surrounding terrain.

Vicinity properties

Cleanup activities at the vicinity properties would cause short-term impacts to very localized scenic resources as the properties are disturbed and their homogeneous scenic character is temporarily disrupted. Once cleanup and revegetation of appropriate areas are complete, the visual characteristics would be similar to pre-remedial action conditions.

Borrow sites

All borrow sites except the Unaweep Canyon site are at existing commercial locations. Therefore, borrow pit operations would not cause any additional significant visual impacts.

The long-term visual impacts associated with the Unaweep Canyon borrow site activities would be minor. The site would be recontoured and revegetated, as necessary.

5.9.2 Cultural resources

No action

The no action alternative would have no impacts on cultural resources.

Stabilization at the Grand Junction site

No cultural resources would be impacted by stabilization at the Grand Junction site.

The mill building is part of the first sugar beet factory in Colorado. The original buildings have been extensively altered and the site disturbed. The State Historic Preservation Officer (SHPO) has determined that the mill is not eligible to the NRHP.

Disposal at the Cheney Reservoir site with truck or train and truck transport

There are four lithic scatter sites within the Cheney Reservoir study area that require additional data to determine their eligibility to the NRHP. Should these sites be eligible, and if the Cheney disposal alternative is chosen, a data recovery plan would be designed and implemented, in consultation with the SHPO and BLM.

Disposal at the Two Road site with truck or train and truck transport

No cultural resources would be impacted by disposal at the Two Road site.

Vicinity properties

Most if not all of the vicinity properties are ineligible to the NRHP because they are younger than 50 years. Should a vicinity property older than 50 years be identified, a cultural resource survey would be conducted, with SHPO consultation.

Borrow sites

The Unaweep Canyon site has not been surveyed for cultural resources. Prior to any surface disturbances, a cultural resource survey would be conducted and a data collection program implemented, as required. The 32 and C½ borrow site and the Fruita borrow site are disturbed sites and are not expected to yield cultural resources.

5.10 IMPACTS ON POPULATION AND WORK FORCE

The impacts described in the following section are based primarily on output from the Planning and Assessment System (PAS) model, maintained by the State of Colorado - Division of Local Government (PAS, 1985). The terms "population impact" and "employment impact" are used to describe the difference between the baseline population and employment projections of the PAS model (projections excluding project impacts) and the PAS model projections which include project impacts. This section is a summary of the material presented in Appendix K, Socioeconomics and Land Use Information.

5.10.1 No action

The no action alternative would result in the loss of the Grand Junction site for future economic development. Given the substantial amount of available industrial land in the Grand Junction area, the loss of the site and, hence, the adoption of the no action alternative, would not affect the local population or employment levels.

5.10.2 Stabilization at the Grand Junction site

Stabilization at the Grand Junction site would involve an average of 125 project workers over the proposed 33-month construction period starting in 1987. An estimated 101 of these workers would come from the local Mesa County work force, while the remainder (primarily supervisory and field staff workers), would be obtained from outside the county. During the peak construction period, a total of 185 project workers would be employed.

Local indirect project-related employment would be generated by local nonlabor expenditures as the dollars are respent and circulated through the local economy. Similarly, additional project-generated employment would be induced as project wage and salary payments are circulated through the local economy. Including these secondary employment impacts, total project-related employment is expected to reach a peak of 356 persons in 1988, reducing the countywide unemployment rate by 0.9 percent. During the peak period, an estimated 278 of the 356 workers employed in project generated jobs would reside in the Grand Junction area (defined as the city of Grand Junction and adjacent developable area). The Grand Junction area, estimated by the Planning and Assessment System (PAS, 1985) model, has a 1985 population of 48,286.

In 1987, approximately 64 percent of the total employment generated by the project would be in the construction sector. Approximately 10 percent of the total employment generated would be in the trade sector, five percent in the services sector, and five percent in the government sector. The other sectors would hold smaller shares of the remaining employment generated. As the project continued to completion, the effects of the circulation of project wages, salaries, and nonlabor expenditures would increase the number of indirect and induced jobs. By 1989, the proportion of the project-generated employment held by the construction sector would fall to 53 percent, while the proportions held by trade, services, and government would increase to 13, nine, and six percent, respectively. Once the remedial action was complete, direct project employment would fall to zero and only indirect and induced employment impacts would remain. Trade (30 percent), services (20 percent), and government (15 percent) would hold the largest shares of this remaining employment; the share held by the construction sector would fall to six percent.

The inmigrant project workers and inmigrants searching for work related to the remedial action would create population increases. The peak population impacts on Mesa County and the Grand Junction area would be 501 and 295 persons, respectively. These impacts would result in a 0.6 percent increase in the total population of both Mesa County and the Grand Junction area.

5.10.3 Disposal at the Cheney Reservoir site with truck transport

The Cheney Reservoir with truck transport alternative would involve an average of 128 project workers over the proposed 34-month construction period. Approximately 103 of these workers would be expected to come from the local Mesa County work force, while the remainder, primarily supervisory and field staff workers, would be obtained from outside the county. During the peak construction period, a total of 146 project workers would be employed. The total employment impact (including direct, indirect, and induced jobs) on Mesa County during the peak construction period would reach a peak of 291 jobs in 1988. The total employment generated during the peak period would reduce the countywide unemployment rate by 0.7 percent. Of the total number of persons employed directly, indirectly, or induced by the Cheney Reservoir with truck transport alternative, during the peak period, 229 would be expected to reside in the Grand Junction area.

In 1987, approximately 61 percent of the total employment generated would be in the construction sector. Other sectors holding relatively large shares of the employment generated would include trade (10 percent), transportation/communications/public utilities (eight percent), services (six percent), and government (five percent). By 1989, the proportions of project-generated employment held by the construction and transportation/communications/public utilities sectors which would hold substantial shares of direct project employment, would decline (to 56 and six percent, respectively), while the proportions held by trade, services, and government would increase (to 12, eight, and six percent, respectively). Once the remedial action was complete, direct project employment would fall to zero and the proportion of the project-generated indirect and induced employment held by the construction and transportation/communications/public utilities sectors would fall to 26 percent and five percent, respectively. The shares held by the trade, services, and government sectors would increase to 21, 15, and 11 percent, respectively.

The countywide population impact caused by inmigrant project workers and inmigrants searching for work related to the remedial action would reach a peak of 560 persons in 1989. The estimated population impact on the Grand Junction area would reach a peak of 322 persons in 1989, or 0.7 percent of the Grand Junction area population.

5.10.4 Disposal at the Cheney Reservoir site with train and truck transport

The Cheney Reservoir with train and truck transport alternative would involve an average of 112 project workers over the proposed 34-month construction period starting in April, 1987. Approximately 89 of these workers would come from the local Mesa County work force, while the remainder, primarily supervisory and field staff workers, would be obtained outside the county. During the peak construction period, a total of 127 project workers would be employed. The total employment impact (including direct, indirect, and induced jobs) on Mesa County would reach a peak of 315 jobs in 1988. The employment generated during the peak period would reduce the countywide unemployment rate by 0.8 percent. Of the total number of persons employed, directly, indirectly, or induced during the peak period, 244 would reside in the Grand Junction area.

In 1987, approximately 52 percent of the total employment generated would be in the construction sector. Other sectors holding relatively large shares of the employment generated would include transportation/communications/public utilities (13 percent), trade (10 percent), and manufacturing and services (both 10 percent). By 1989, the proportions of project-generated employment held by the construction, transportation/communications/public utilities and manufacturing sectors, which hold substantial shares of direct project employment, would decline (to 51, nine, and five percent, respectively), while the proportion held by trade and services would increase (to 12 and eight percent, respectively). Once the remedial action was complete, direct project employment would fall to zero; the proportion of the project-generated employment held by the construction and transportation/communications/public utilities sectors would fall to 25 percent and seven percent, respectively; the shares held by the trade and services sectors would increase to 22 and 15 percent, respectively; and the share held by the manufacturing sector would remain at five percent.

The countywide population impact caused by inmigrant project workers and inmigrants searching for remedial action related work would reach a peak of 555 persons in 1989. This peak would represent a 0.6 percent increase in the county population. The estimated population impact on the Grand Junction area would reach a peak of 329 persons in 1989, or 0.7 percent of the Grand Junction area population.

5.10.5 Disposal at the Two Road site with truck transport

Relocation of the tailings to the Two Road site with truck transport would involve an average of 127 project workers over the proposed 34-month construction period starting in 1987. Approximately 103 of these workers would come from the local Mesa County work force, while the remainder, primarily supervisory and field staff workers, would be obtained outside the county. During the peak construction period, a total of 147 project workers would be employed. The total employment impact (including direct, indirect, and induced jobs) would reach a peak of 327 jobs in 1988. The total employment generated during the peak period would reduce the countywide unemployment rate by 0.8 percent. Of the total number of employed, directly, indirectly, or induced during the peak period, 253 would reside in the Grand Junction area.

In 1987, approximately 61 percent of the total employment generated would be in the construction sector. Other sectors holding relatively large shares of the employment generated would include trade (10 percent), transportation/communications/public utilities (eight percent), services (six percent), and government (five percent). By 1989, the proportions of project-generated employment held by the construction and transportation/communications/public utilities sectors, which hold larger shares of direct project employment, would decline (to 54 and seven percent, respectively), while the proportions held by trade, services, and government would increase (to 13, eight, and six percent, respectively). Once the remedial action was complete, direct project employment would fall to zero; the proportion of the project-generated indirect and induced employment held by the construction and transportation/communications/public utilities sectors would fall to 25 percent and six percent, respectively; the shares held by the trade, services, and government sectors would increase to 22, 16, and 11 percent, respectively.

The population impact caused by inmigrant project workers and inmigrants searching for work related to the remedial action would reach a peak of 596 persons in 1989. This peak would represent a 0.7 percent increase in the county population. The estimated population impact on the Grand Junction area would reach a peak of 355 persons in 1989, or 0.7 percent of the Grand Junction area population.

5.10.6 Disposal at the Two Road site with train and truck transport

Relocation of the tailings to the Two Road site with train and truck transport would involve an average of 118 project workers over the proposed 34-month construction period starting in 1987. Approximately 94 of these workers would come from the local Mesa County work force, while the remainder, primarily supervisory and field staff workers, would be obtained outside the county. During the peak construction period, a total of 136 project workers would be employed. The total employment impact (including indirect and induced jobs) on Mesa County would reach a peak of 346 jobs in 1988. The total employment generated during the peak period would reduce the countywide unemployment rate by 0.8 percent. Of the total number of employed, directly, indirectly, or induced during the peak period, 269 would be expected to reside in the Grand Junction area.

In 1987, approximately 51 percent of the total employment generated would be in the construction sector. Other sectors holding substantial shares of the employment generated would include transportation/communications/public utilities (14 percent), trade (10 percent), and services and manufacturing (both at six percent).

By 1989, the proportions of project-generated employment held by the construction and transportation/communications/public utilities sectors, which hold larger shares of direct project employment, would decline (to 50 and nine percent, respectively); the proportions held by trade and services would increase (to 12 and eight percent, respectively); while the share held by manufacturing would decline to five percent. Once the remedial action was complete, direct project employment would fall to zero and the proportion of the project-generated employment (indirect and direct) held by construction and transportation/communications/public utilities sectors would fall to 23 percent and six percent, respectively; the shares held by the trade and services sectors would increase to 22 and 16 percent, respectively. Manufacturing would continue to hold a five percent share.

The countywide population impact caused by inmigrant project workers and inmigrants searching for work related to remedial action would reach a peak of 608 persons in 1989. The estimated population impact on the Grand Junction area would reach a peak of 362 persons in 1989, or 0.7 percent of the Grand Junction area population.

5.10.7 Vicinity properties

The vicinity properties cleanup would involve an average of 495 project workers over the proposed 27-month construction period starting in 1986. Approximately 443 of these workers would come from the local Mesa County work force, while the remainder, primarily supervisory and field staff workers, would be obtained outside the county. During the peak construction period, a total of 815 project workers would be employed.

The total employment impact of the vicinity properties cleanup on Mesa County would reach a peak of 1436 jobs in 1987. The employment generated during the peak period would reduce the countywide unemployment rate by 3.5 percent. Of the total number of employed, directly, indirectly, or induced by the vicinity properties cleanup during the peak period, 1174 would reside in the Grand Junction area.

In 1987, approximately 60 percent of the total employment generated by the vicinity properties cleanup would be in the construction sector. Other sectors holding substantial shares of the employment generated would include trade (13 percent) and services (six percent). As the project continued to completion, the sectorial distribution of project-generated employment would remain roughly constant. Once the remedial action was completed, direct project employment would fall to zero and the proportion of the project-generated indirect and induced employment held by the construction sector would fall to five percent. The shares held by the trade, services, and government sectors would increase to 28, 19, and 14 percent, respectively.

The countywide population impact caused by inmigrant project workers and inmigrants searching for work related to remedial action would reach a peak of 957 persons in 1988. This peak would represent a 1.1 percent increase in the county population. The estimated population impact on the Grand Junction area would reach a peak of 600 persons in 1988, or 1.3 percent of the Grand Junction area population.

5.11 IMPACTS ON HOUSING, SOCIAL STRUCTURE, AND COMMUNITY SERVICES

The following section describes the impacts of the remedial action alternatives on housing, the social structure, and community services in Mesa County and Grand Junction. It represents a summary of more detailed data presented in Appendix K, Socioeconomics and Land Use Information.

5.11.1 No action

The Grand Junction site is located in an industrial area which is interspersed with houses to the west. Due to the industrial nature of the area and the abundance of land suitable for building sites in the Grand Junction area, it is concluded that the no action alternative would have no impact on local housing. Because no project work force would be employed, no impacts on the local social structure or community services would be expected. However, community recreational services would be affected since the Grand Junction site could not be developed into part of the Colorado River Park System as set forth in the Parks and Recreation Plan of the City of Grand Junction.

5.11.2 Stabilization at the Grand Junction site

The stabilization at the Grand Junction site would bring maximum population increases to Mesa County and the Grand Junction area of 501 and 295 people, respectively. The 1980 Mesa County and Grand Junction housing stocks were 32,573 and 12,706 total housing units, respectively. Considering the size of the housing stocks relative to the expected population increases, combined with the recent Mesa County and Grand Junction population declines, an adequate supply of housing would be available for project-related inmigrants.

No impacts on the social structure of Mesa County or Grand Junction would occur.

A maximum of 105 school age (five to 18 years old) children would be expected to inmigrate to Mesa County with their parents as a result of the remedial action. Enrollment in the Mesa County Valley School District fell by 879 students, from 16,460 in 1983 to 15,581 in 1984 as the local population declined. Thus, adequate facilities exist to accommodate the inmigrant population.

Project population-related water consumption would be expected to reach a peak in 1989 of 125,250 gallons per day in Mesa County, using a 250 gallon per day per capita consumption factor. Direct project use would include 65.3 million gallons of non-potable water for compaction, dust control, and vehicle wash; it would also include 1.1 million gallons for drinking, showers, and laundry. Given the size of the available water supplies, no problems would be expected regarding the required quantities of water.

The project population-related sewage generated in Mesa County would be expected to reach a peak of 50,100 gallons per day in 1989 using a 100 gallon per day per capita sewage generation factor. The recently completed Grand Junction waste-water treatment plant is currently operating well below capacity. Thus, regarding sewage treatment capacity, no problems would be expected.

An estimated 1,768,000 kilowatt-hours of electricity would be used directly for project-related activity. Additional demands would be placed on electricity supplies, natural gas supplies, telephone services, police and fire protection services, and other community services. However, since community facilities and services have been built to accommodate a larger population than currently exists in Grand Junction and Mesa County, no adverse impacts would be expected.

5.11.3 Disposal at the Cheney Reservoir site with truck transport

This alternative would bring maximum population increases to the Mesa County and Grand Junction area of 560 and 322 people, respectively. An adequate supply of housing would be available for project-related inmigrants.

No impacts on the social structure of Mesa County or Grand Junction would be expected.

A maximum of 117 school age (five to 18 years old) children would be expected to inmigrate to Mesa County with their parents as a result of the remedial action. Adequate facilities exist to accommodate the inmigrant population.

Project population-related water consumption would be expected to reach a peak in 1989 of 139,750 gallons per day in Mesa County. Direct project use would include 70.7 million gallons of non-potable water for compaction, dust control, and vehicle wash; it would also include 1.8 million gallons for drinking, showers, and laundry. No problems would be expected regarding the required quantities of water.

The project population-related sewage flow in Mesa County would be expected to reach a peak of 55,900 gallons per day in 1989. No problems would be expected regarding sewage treatment capacity.

An estimated 1,323,000 kilowatt-hours of electricity would be used directly for project-related activity. Additional demands would be placed on electricity supplies, natural gas supplies, telephone services, police and fire protection services, and other community services. No adverse impacts on these services would be expected.

5.11.4 Disposal at the Cheney Reservoir site with train and truck transport

This alternative would bring maximum population increases to Mesa County and the Grand Junction area of 555 and 329 people, respectively. An adequate supply of housing would be available for project-related inmigrants.

No impacts on the social structure of Mesa County or Grand Junction would be expected.

A maximum of 115 school age (five to 18 years old) children would be expected to inmigrate to Mesa County with their parents as a result of the remedial action. Adequate facilities exist to accommodate the inmigrant population.

Project population-related water consumption would be expected to reach a peak in 1989 of 138,750 gallons per day in Mesa County. Direct project use would include 69.9 million gallons of non-potable water for compaction, dust control, and vehicle wash; it would also include 1.7 million gallons for drinking, showers, and laundry. No problems would be expected regarding the required quantities of water.

The project population-related sewage flow in Mesa County would be expected to reach a peak of 55,500 gallons per day in 1989. No problems would be expected regarding sewage treatment capacity.

An estimated 1,323,000 kilowatt-hours of electricity would be used directly for project-related activity. Additional demands would be placed on electricity supplies, natural gas supplies, telephone services, police and fire protection services, and other community services. No adverse impacts on these services would be expected.

5.11.5 Disposal at the Two Road site with truck transport

This alternative would bring maximum population increases to Mesa County and the Grand Junction area of 596 and 355 people, respectively. An adequate supply of housing would be available for project-related inmigrants.

No impacts on the social structure of Mesa County or Grand Junction would be expected.

A maximum of 124 school age (five to 18 years old) children would be expected to inmigrate to Mesa County with their parents as a result of the remedial action. Adequate facilities exist to accommodate the inmigrant population.

Project population-related water consumption would be expected to reach a peak in 1989 of 149,000 gallons per day in Mesa County. Direct project use would include 67.3 million gallons of non-potable water for compaction, dust control, and vehicle wash; it would also include 1.9 million gallons for drinking, showers, and laundry. No problems would be expected regarding the required quantities of water.

The project population-related sewage flow in Mesa County would be expected to reach a peak of 59,600 gallons per day in 1989. No problems would be expected regarding sewage treatment capacity.

An estimated 1,365,000 kilowatt-hours of electricity would be used directly for project-related activity. Additional demands would be placed on electricity supplies, natural gas supplies, telephone services, police and fire protection services, and other community services. No adverse impacts on these services would be expected.

5.11.6 Disposal at the Two Road site with train and truck transport

This alternative would bring maximum population increases to Mesa County and the Grand Junction area of 608 and 362 people, respectively. An adequate supply of housing would be available for project-related inmigrants.

No impacts on the social structure of Mesa County or Grand Junction would be expected.

A maximum of 127 school age (five to 18 years old) children would be expected to inmigrate to Mesa County with their parents as a result of the remedial action. Adequate facilities exist to accommodate the inmigrant population.

Project population-related water consumption would be expected to reach a peak in 1989 of 152,000 gallons per day in Mesa County. Direct project use would include 70.4 million gallons of non-potable water for compaction, dust control, and vehicle wash; it would also include 1.7 million gallons for drinking, showers, and laundry. No problems would be expected regarding the required quantities of water.

The project population-related sewage flow in Mesa County would be expected to reach a peak of 60,800 gallons per day in 1989. No problems would occur regarding sewage treatment capacity.

An estimated 1,365,000 kilowatt-hours of electricity would be used directly for project-related activity. Additional demands would be placed on electricity supplies, natural gas supplies, telephone services, police and fire protection services, and other community services. No adverse impacts on these services would be expected.

5.11.7 Vicinity properties

The vicinity properties cleanup would bring maximum population increases to Mesa County and the Grand Junction area of 957 and 600 people, respectively. An adequate supply of housing would be expected to be available for project-related inmigrants.

No impacts on the social structure of Mesa County or Grand Junction would be expected.

A maximum of 167 school age (five to 18 years old) children would be expected to inmigrate to Mesa County with their parents as a result of the remedial action. Adequate facilities exist to accommodate the inmigrant population.

Project population-related water consumption would be expected to reach a peak in 1988 of 239,250 gallons per day in Mesa County. Direct project use would include 12.0 million gallons of non-potable water for compaction, dust control, and vehicle wash; drinking, showers, and laundry. No problems would be expected regarding the required quantities of water.

The project population-related sewage flow in Mesa County would be expected to reach a peak of 95,700 gallons per day in 1988. No problems would be expected regarding sewage treatment capacity.

An estimated 6930 kilowatt-hours of electricity would be used directly for project-related activity. Additional demands would be placed on electricity supplies, natural gas supplies, telephone services, police and fire protection services, and other community services. No adverse impacts on these services would be expected.

5.12 IMPACTS ON ECONOMIC STRUCTURES

The Planning and Assessment System (PAS) model, which is maintained by the State of Colorado Division of Local Government (PAS, 1985) was used to develop personal income and labor income impacts described in the following section. The model captures the direct, indirect, and induced income effects resulting from project wage and salary payments and nonlabor expenditures. The terms "personal income impact" and "labor income impact" will be used to describe the difference between the baseline projections, which exclude project impacts, and the projected scenario which includes project impacts.

5.12.1 No action

The no action alternative would not affect economic structures in Mesa County or Grand Junction. The Grand Junction site would continue to be undeveloped. However, the Grand Junction area has an abundant supply of industrial land capable of accommodating economic growth in the area.

5.12.2 Stabilization at the Grand Junction site

The personal income impact of this alternative on Mesa County would reach a peak of $9.2 million in 1988, an increase of 0.9 percent over the projected Mesa County personal income level without the project. An estimated $10.1 million in direct project wage and salary payments, combined with local nonlabor purchases, would translate into a total increase in Mesa County personal income of $22.1 million over the 1987 to 1995 period.

The labor income impact on Mesa County would reach a peak of $8.4 million in 1988, representing an increase of 1.2 percent over the projected Mesa County labor income level without the project. The direct project wage and salary payments, combined with local nonlabor purchases, would translate into a total increase in Mesa County labor income of $20.2 million over the 1987 to 1995 period.

Local, state, and Federal tax receipts would be affected by the implementation of the stabilization on site alternative. The primary taxes affected would be state and Federal income taxes. Local and state sales taxes would not be affected directly because purchases of supplies, materials, and equipment by contractors for Federal projects are exempt from state and local sales taxes upon application for exemption by contractors. Local property tax receipts would be slightly reduced by the removal of the Grand Junction site from the tax rolls. The Grand Junction site is currently assessed at $13,450 and faces a mill levy of 79,315 mills (Mesa County Assessor, 1985); thus, Mesa County would lose approximately $1,070 in property taxes annually.

State income taxes would increase because of taxes on wages and salaries earned by project workers and because of taxes on project-related indirect and induced increases in local labor income. Prior study shows that the average annual state income tax rate for incomes between $25,000 and $35,000 is approximately two percent (DOE, 1984). Applying this rate to the projected $20.2 million increase in project-related labor income, an increase of $400,000 in state income tax receipts would be expected over the 1987 to 1995 period. Assuming an average Federal income tax rate of 15 percent, Federal income tax receipts would increase by a total of $3.0 million over the same period. Smaller additional increases in state and Federal income tax receipts would be expected as a result of project-related income generated from nonlabor purchases outside Mesa County.

5.12.3 Disposal at the Cheney Reservoir site with truck transport

The personal income impact of this alternative on Mesa County would reach a peak of $7.5 million in 1988, an increase of 0.8 percent over the projected Mesa County personal income level without the project. An estimated $10.3 million in direct project wage and salary payments, combined with local nonlabor purchases, would translate into a total increase in Mesa County personal income of $20.6 million over the 1987 to 1995 period.

The labor income impact on Mesa County would reach a peak of $6.9 million in 1988, representing an increase of 0.9 percent over the projected Mesa County labor income level without the project. The direct project wage and salary payments, combined with local nonlabor purchases, would translate into a total increase in Mesa County labor income of $18.7 million over the 1987 to 1995 period.

State and local sales taxes would not be directly affected by the implementation of the Cheney Reservoir truck alternative. The Grand Junction site could be developed; thus, Mesa County would continue to receive property taxes from the owners. The projected $18.7 million increase in project-related labor income would result in an increase of $375,000 in state income tax receipts over the 1987 to 1995 period. Federal income tax receipts would increase by a total of $2.8 million over the same period. Smaller additional increases in state and Federal income tax receipts would be expected as a result of project-related income generated from nonlabor purchases outside Mesa County.

5.12.4 Disposal at the Cheney Reservoir site with train and truck transport

The personal income impact of this alternative on Mesa County would reach a peak of $8.0 million in 1988, an increase of 0.8 percent over the projected Mesa County personal income level without the project. An estimated $8.7 million in direct project wage and salary payments, combined with local nonlabor purchases, would translate into a total increase in Mesa County personal income of $21.0 million over the 1987 to 1995 period.

The labor income impact of the Cheney Reservoir train and truck alternative on Mesa County would reach a peak of $7.3 million in 1988, an increase of one percent over the projected Mesa County labor income level without the project. The direct project wage and salary payments, combined with local nonlabor purchases, would translate into a total increase in Mesa County labor income of $19.1 million over the 1987 to 1995 period.

State and local sales taxes would not be directly affected by the implementation of the Cheney Reservoir train and truck alternative. The Grand Junction site could be developed; thus, Mesa County would continue to receive property taxes from the owners.

The projected $19.1 million increase in project-related labor income would result in an increase of $380,000 in state income tax receipts over the 1987 to 1995 period. Federal income tax receipts would increase by a total of $2.9 million over the same period. Smaller additional increases in state and Federal income tax receipts would be expected as a result of project-related income generated from nonlabor purchases outside Mesa County.

5.12.5 Disposal at the Two Road site with truck transport

The personal income impact of this alternative on Mesa County would reach a peak of $8.4 million in 1988, an increase of 0.9 percent over the projected Mesa County personal income level without the project. An estimated $10.3 million in direct project wage and salary payments, combined with local nonlabor purchases, would translate into a total increase in Mesa County personal income of $24.9 million over the 1987 to 1995 period.

The labor income impact of the Two Road truck alternative on Mesa County would reach a peak of $7.7 million in 1988, or an increase of one percent over the projected Mesa County labor income level without the project. The direct project wage and salary payments, combined with local nonlabor purchases, would translate into a total increase in Mesa County labor income of $22.6 million over the 1987 to 1995 period.

State and local sales taxes would not be directly affected by the implementation of the Two Road truck alternative. The Grand Junction site could be developed; thus, Mesa County would continue to receive property taxes from the owners. The projected $22.6 million increase in project-related labor income would be expected to result in an increase of $450,000 in state income tax receipts over the 1987 to 1995 period. Federal income tax receipts would increase by a total of $3.4 million over the same period. Smaller additional increases in state and Federal income tax receipts would be expected as a result of project-related income generated from nonlabor purchases outside Mesa County.

5.12.6 Disposal at the Two Road site with train and truck transport

The personal income impact of this alternative on Mesa County would reach a peak of $8.8 million in 1988, an increase of 0.9 percent over the projected Mesa County personal income level without the project. An estimated $9.4 million in direct project wage and salary payments, combined with local nonlabor purchases, would translate into a total increase in Mesa County personal income of $23.0 million over the 1987 to 1995 period.

The labor income impact of the Two Road train and truck alternative on Mesa County would reach a peak of $8.0 million in 1988, or an increase of 1.1 percent over the projected Mesa County labor income level without the project. The direct project wage and salary payments, combined with local nonlabor purchases, would translate into a total increase in Mesa County labor income of $20.9 million over the 1987 to 1995 period.

State and local taxes would not be directly affected by the implementation of the Two Road train and truck alternative. The Grand Junction site could be developed; thus, Mesa County would continue to receive property taxes from the owners. The projected $20.9 million increase in project-related labor income would result in an increase of $420,000 in state income tax receipts over the 1987 to 1995 period. Federal income tax receipts would increase by a total of $3.1 million over the same period. Smaller additional increases in state and Federal income tax receipts would be expected as a result of project-related income generated from nonlabor purchases outside Mesa County.

5.12.7 Vicinity properties

The personal income impact on Mesa County of vicinity properties cleanup would reach a peak of $34.6 million in 1987, an increase of 3.6 percent over the projected Mesa County personal income level without the project. An estimated $28.8 million in direct project wage and salary payments, combined with local nonlabor purchases, would translate into a total increase in Mesa County personal income of $57.7 million over the 1987 to 1995 period.

The labor income impact of the vicinity properties cleanup would reach a peak of $31.8 million in 1987, or an increase of 4.4 percent over the projected Mesa County labor income level without the project. The direct project wage and salary payments, combined with local nonlabor purchases, would translate into a total increase in Mesa County labor income of $52.4 million over the 1987 to 1995 period.

State and local taxes would not be directly affected by the implementation of the vicinity properties cleanup. The projected $52.4 million increase in project-related labor income would result in an increase of $1,050,000 in state income tax receipts over the 1987 to 1995 period. Federal income tax receipts would increase by a total of $7.9 million over the same period. Smaller additional increases in state and Federal income tax receipts would be expected due to project-related income generated from nonlabor purchases outside Mesa County.

5.13 IMPACTS ON TRANSPORTATION NETWORKS

For purposes of this EIS, the DOE examined the routes described in Section 4.12.7 to realistically estimate upperbound impacts from remedial action. This is not to say that the routes considered are the "best" available or will be used in their entirety during remedial action. In fact, based upon input from reviewers of the DEIS, DOE has concluded that the impacts of hauling the tailings one way along D and 32 Roads to the Cheney Reservoir site would be greater than hauling both ways across the 5th Street Bridge. Under investigation is the possibility that the 5th Street Bridge replacement and tailings relocation could be phased so that the two activities are not concurrent. Studies of these and other alternatives with a variety of specific mitigations to reduce impacts will be performed during the final design.

5.13.1 Traffic

The impacts of each remedial action alternative, stated in terms of the percentage increase in average daily traffic volumes on the proposed routes, are presented in Table 5.11. The specific roads and highways comprising the routes displayed in the table are contained in Section 4.12.7.

Stabilization at the Grand Junction site would involve an average and peak of 154 and 247 respective round-trips daily for trucks carrying borrow materials from the 32 and C½ borrow site to the Grand Junction processing site. Thus, the route between the sites would be travelled an average (peak) of 308 (494) times daily. This would represent a percentage increase in average daily traffic along the route ranging from four (six) percent to 28 (45) percent. Trucking quarried material from the Unaweep Canyon borrow site to the Grand Junction site would involve an average (peak) of 51 (98) round-trips daily. U.S. Highway 50 between 32 Road and Route 141 and Route 141 between U.S. Highway 50 and the Unaweep Canyon borrow site would be used for both initial and return trips and would, therefore, be travelled an average (peak) of 101 (196) times daily. The remainder of the route, being travelled once each round-trip, would be travelled an average (peak) of 51 (98) times daily. The percentage increase in traffic associated with the truck trips to and from the Unaweep Canyon borrow site ranges from less than one percent under both average and peak conditions on U.S. Highway 50 between Unaweep and Noland Avenues to eight percent under average conditions and 15 percent under peak conditions on Struthers Avenue between 7th Street and the processing site.

Disposal of tailings at the Cheney Reservoir site with truck transport would involve 209 round-trips daily under both average and peak conditions. Thus, U.S. Highway 50 between 32 Road and the turn-off for the Cheney Reservoir site, being used for both initial and return truck trips, would be travelled 418 times daily; the remainder of the route, being travelled only once each round-trip, would be travelled 209 times daily. The percentage increases in daily traffic volumes along the route under both average and peak conditions would range from one percent on U.S. Highway 50 between Unaweep and Noland Avenues to 32 percent on Struthers Avenue between 7th Street and the processing site.

Under both average and peak conditions, disposal of the tailings at the Cheney Reservoir site with train and truck transport would involve 209 one-way trips daily for trucks between Whitewater and the turn-off for the Cheney Reservoir site. Trucking borrow material from the Cheney Reservoir site to the Grand Junction site would involve 34 one-way trips daily under both average and peak conditions. Thus, the maximum increase in traffic on U.S. Highway 50 would be 418 vehicles per day, while the maximum increase in traffic on affected streets in Grand Junction would be 68 vehicles per day. Under both average and peak conditions, the percentage increase in daily traffic volume would range from less than one percent on U.S. Highway 50 between 4th Street and Unaweep Avenue to 10 percent on Struthers Avenue between 7th Street and the processing site.

Table 5.11 Impacts on average daily traffic volumes by remedial action alternative

Alternative	Route	Current average daily traffic	Remedial action truck trips[a]		Percent increase in average daily traffic	
			Average	Peak	Average	Peak
Stabilization on site	32 & C½ - processing site;	1,100 - 8,050	154	247	4-28	6-45
	Unaweep-processing site	650 - 21,500	51[b]	98[b]	1-8[b]	1-15[b]
Cheney Reservoir-truck	Processing site-Cheney Reservoir	650 - 21,500	209	209	1-32	1-32
Cheney Reservoir-train/truck	Whitewater-Cheney Reservoir	3,800	209	209	11	11
	Cheney Reservoir-processing site	400 - 21,500	34	34	<1-10	<1-10
Two Road-truck	Processing site - Two Road site;	650 - 22,000	209	209	2-64	2-64
	Fruita borrow pit - Two Road site	1,100 - 3,400	30[c]/23[d]	30[c]/23[d]	2[c]/1[d]-5[c]/4[d]	2[c]/1[d]-5[c]/4[d]
Two Road-train/truck	Mack- Two Road site	1,100	209	209	38	38
	Two Road site - processing site;	1,100 - 22,000	34	34	<1-6	<1-6
	Fruita borrow pit - Two Road site	1,100 - 3,400	30[c]/23[d]	30[c]/23[d]	2[c]/1[d]-5[c]/4[d]	2[c]/1[d]-5[c]/4[d]

[a]Round-trips.
[b]Over first 21 months of project only.
[c]Over months 2-4 of project only.
[d]Over months 17-34 of project only.

Disposal of the tailings at the Two Road site with truck transport would involve an average and peak of 209 round-trips. Thus, the proposed route would be travelled a total of 418 times daily. This would represent a percentage increase in traffic ranging from two percent on U.S. Highway 6 & 50 (Loop 70) between North Avenue and 25 Road to 64 percent on Struthers Avenue between the processing site and 9th Street. The transfer of borrow materials from the Fruita borrow site to the Two Road site would involve an average and peak of 30 daily round-trips during months two through four of the construction period, while an average and peak of 23 daily round-trips would be made during months 17 to 34 of the construction period. Thus, trucks would travel the proposed route between the Fruita borrow site and the Two Road site a maximum of 60 times daily. The maximum would represent a percentage increase in daily traffic ranging from two percent on Interstate 70 between Fruita and Loma to five percent on U.S. Highway 6 & 50 between Mack and Two Road.

Under both average and peak conditions, disposal of the tailings at the Two Road site with train and truck transport would involve 209 one-way trips daily for trucks between Mack and the Two Road site. Trucking borrow material from the Two Road site to the Grand Junction site would involve 34 one-way daily truck trips under both average and peak conditions. Trucking borrow materials from the Fruita borrow site to the Two Road site would involve an average and peak of 30 daily round-trips during months two through four of the construction period, while an average and peak of 23 daily round-trips would be made during months 17 to 34 of the construction period.

Under average and peak conditions, trucks would make a maximum of 478 trips daily on U.S. Highway 6 & 50 between Mack and Two Road. This maximum would represent a percentage increase in traffic of 43 percent. Trucks would travel the route between Mack and the Grand Junction site a total of 68 times daily under average and peak conditions, representing a percentage increase in average daily traffic ranging from less than one percent on U.S. Highway 6 & 50 (Loop 70) between 25 Road and North Avenue to two percent on Interstate 70 between Mack and Loma.

The vicinity properties cleanup would involve approximately 80 truck trips daily from both the 32 and C½ borrow site to the active vicinity properties and from the active vicinity properties to the processing site. Because vicinity properties are spread throughout Grand Junction, the impacts on traffic networks would also be spread throughout Grand Junction to a certain extent. 32 Road, which would lead to the borrow site and the streets nearest the processing site, would receive the greatest amount of vicinity property traffic; these roads would also receive the greatest cumulative impact if vicinity property cleanup and remedial action on the tailings pile occur simultaneously as proposed.

5.13.2 Road maintenance

The design and integrity of roads are determined by a number of factors: traffic loads, materials used, structural conditions, and environmental influences. Minimum design criteria are applied to all roads in Colorado to ensure uniform practice. This section provides a description of the possible impacts of the remedial action and vicinity properties cleanup on the roads.

The Colorado Department of Highways has rated all state roads in a number of categories. A breakdown of these categories stated in terms of their proportional contributions to the "total weight" rating, or the overall conditions of the road, is presented in Table 5.12. No data are available in this form for county roads, city streets, or Interstate 70.

The total weighted ratings available for the state roads potentially used in the remedial action and vicinity properties cleanup are presented in Table 5.13.

The total weighted ratings indicated that the state roads potentially used for remedial action are in average condition. State Route 141 (32 Road) north of D Road has been upgraded. Plans to upgrade Two Road during the time period preceding the proposed remedial action also exist (Trainor, 1985). Visual inspection indicates the majority of city and county roads potentially used for remedial action and vicinity properties cleanup are also in average condition. The majority of the roads near the Grand Junction site have adequate substructures since they were built to carry traffic to the industrial area of the processing site (Carmen, 1985).

A previous study performed by the DOE indicated that the most severe road damage, and therefore the greatest road maintenance, considering all of the routes potentially travelled under each alternative, would be Struthers Avenue and U.S. Highway 6 & 50 between Mack and Two Road. The roads expected to incur the least damage were Ute and Pitkin Avenues and U.S. Highway 50 between South Avenue and the turn-off for the Cheney Reservoir site (DOE, 1983a). The Mesa County Road Department is currently conducting substructure tests on various roads, some of which would potentially be used during remedial action. The results of these tests will lend additional insight into the potential damage to roads resulting from remedial action and vicinity properties cleanup. The project would provide funding for the road maintenance indirectly because DOE's contractors for remedial action would be required to pay road use taxes to the State of Colorado for all trucks using public roads.

5.13.3 Traffic congestion

Two road segments which would be used during remedial action currently have some traffic congestion during morning (7:30 to 8:30) and evening (4:30 to 5:30) rush hours (Kenney, 1985). These segments are U.S. Highway 50 between Ute Avenue and Unaweep Avenue and 9th Street between Struthers Avenue and Ute Avenue.

Stabilization at the Grand Junction site and disposal at the Cheney Reservoir site with truck transport would add to the existing congestion on U.S. Highway 50. Disposal at the Two Road site

Table 5.12 Rating system for state roads in Colorado

Rating category	Road type: Rural and developed	Road type: Urban
Pavement condition	35	25
Skid resistance	10	5
Structural condition	20	-
Hazard index	20	20
Capacity	15	50
Total weight	100	100

Ref. Colorado Department of Highways, 1981.

Table 5.13 Total weighted rating of selected state roads

Road	Total weighted rating
State Route 146	46
U.S. Highway 50	79
Ute Avenue	62
Pitkin Avenue	62
U.S. Highway 6 & 50 (Loop 70)	81
U.S. Highway 6 & 50 (Mack to Two Road)	50

Ref. Colorado Department of Highways, 1981.

with truck transport would add to the existing congestion on 9th Street. In addition, all of the alternatives, except no action, would add sufficient traffic to cause a minor amount of congestion on city streets around the Grand Junction site.

5.14 USE OF ENERGY AND OTHER RESOURCES

The no action alternative would not require the use of any resources. All of the action alternatives would require the use of fuel, electricity, water, manpower, construction materials, and financial resources. Fuel would be used to operate construction equipment, haul trucks, and trains. Electricity would be used for lighting and the operation of small construction equipment. Water would be used for compaction, dust suppression, washing equipment, and personal hygiene. Construction materials would primarily be various types of earth (soil and rock) for the construction of radon and erosion protection barriers. Manpower and financial resources would be required for all aspects of the project. Table 5.14 lists the resource requirements for each alternative.

5.15 IMPACTS FROM ACCIDENTS NOT INVOLVING RADIATION

5.15.1 Traffic accidents

The various remedial action alternatives would involve varying numbers of truck trips as tailings, other contaminated materials, and borrow materials are transported to and from the disposal site, and borrow sites. Project workers would also be commuting between their homes and their work site. Because a substantial proportion of the project work force is expected to be available locally, an average commuting distance of five miles (one-way) is assumed for stabilization at the Grand Junction site, 10 miles for disposal at the Cheney Reservoir site, 15 miles for disposal at the Two Road site, and five miles for the vicinity properties cleanup.

Table 5.15 lists the accident rates for the road segments that would be used for each of the remedial action alternatives and Table 5.16 lists the estimated number of injury accidents, fatal accidents, and total accidents for each of the remedial action alternatives.

No action

The no action alternative would result in no impact on the number of traffic accidents in Mesa County.

Stabilization at the Grand Junction site

The stabilization at the Grand Junction site would involve approximately 4.165 million vehicle-miles of off-site travel. A total of 0.09 accidents would be expected to be fatal accidents, 4.50 injury accidents, and 13.19 total accidents.

Table 5.14 Resource requirements for remedial action alternatives

Resource	No action	Stabilization at Grand Junction	Disposal at the Cheney Reservoir site with truck transport	Disposal at the Cheney Reservoir site with train and truck transport	Disposal at the Two Road site with truck transport	Disposal at the Two Road site with train and truck transport	Vicinity properties
Fuel (millions of gallons)	0	3.247	4.948	5.147	5.108	6.818	1.740
Electricity (million kwh)	0	1.768	1.323	1.323	1.365	1.365	0.007
Water (millions of gallons)	0	66.41	72.548	73.105	69.174	69.834	11.986
Financial resources (millions of dollars)	0	65.38	56.30	93.17	77.48	106.69	99.36

Table 5.15 Injury, fatal, and total accident rates for road segments potentially used during remedial action[a]

Road	Segment	Accident rates: Injury[b]	Fatal[c]	Total[b,d]	Distance
I-70	A - Mack to Fruita	0.35	2.70	1.04	3.90
I-70	B - Fruita to Loop 70	0.35	2.70	1.04	10.60
Loop 70	C - I-70 to 5th St.	1.53	3.20	7.63	6.00
Loop 70	D - 5th St. to 9th St.	1.53	3.20	7.63	0.30
U.S. 50	E - Noland Av. to B½ Rd.	1.33	4.30	5.18	1.80
U.S. 50	F - B½ Rd to State Route 146	0.73	2.80	1.39	4.20
U.S. 50	G - State Rt. 146 to State Rt. 141	0.73	2.80	1.39	2.60
U.S. 50	H - State Rt. 141 to Cheney Turnoff	0.73	2.80	1.39	7.20
State Rt. 146	J - D Rd to C½ Rd	1.70	5.90	6.09	0.50
State Rt. 146	J - C½ Rd. to U.S. 50	1.70	5.90	6.09	3.80
D Rd	K - 12th St. to 15th St	1.90	2.00[e]	3.69	0.25
D Rd	L - 15th St. to State Rt. 146	1.90	2.00[e]	3.6	4.75
All County Roads		0.72	2.00	2.85	--

[a]From Trainor, 1985, and Colorado Department of Highways, 1985; reflecting 1981-1983 accident data.
[b]Accidents/million vehicle-miles travelled.
[c]Accidents/100 million vehicle-miles travelled.
[d]Total refers to all property damage accidents and includes injuries and fatal accidents.
[e]Countywide rate used since no fatal accidents were recorded on D Road over the 1981-1983 period.

Table 5.16 Estimated number of traffic-related injury, fatal, and total accidents by remedial action alternative

Road	Segment[a]	Stabilization on site VMT[b] (000's)	Accidents Injury	Accidents Fatal	Total[c]	Cheney Reservoir truck VMT[b] (000's)	Accidents Injury	Accidents Fatal	Total[c]	Cheney Reservoir train/truck VMT[b] (000's)	Accidents Injury	Accidents Fatal	Total[c]
I-70	A	--	--	--	--	--	--	--	--	--	--	--	--
I-70	B	--	--	--	--	--	--	--	--	--	--	--	--
Loop 70	C	--	--	--	--	--	--	--	--	--	--	--	--
Loop 70	D	--	--	--	--	--	--	--	--	--	--	--	--
U.S. 50	E	32.4	0.04	0.001	0.17	306.0	0.41	0.13	1.59	93.6	0.12	0.0004	0.48
U.S. 50	F	75.6	0.06	0.002	0.11	714.0	0.52	0.020	0.99	218.4	0.16	0.006	0.30
U.S. 50	G	93.6	0.07	0.003	0.13	884.0	0.65	0.25	1.22	135.2	0.10	0.0004	0.19
U.S. 50	H	--	--	--	--	2,448.0	1.78	0.069	3.40	2,448.0	1.78	0.069	3.40
State Rt. 146	I	109.0	0.19	0.006	0.66	85.0	0.14	0.005	0.52	--	--	--	--
State Rt. 146	J	68.4	0.12	0.004	0.42	646.0	1.10	0.038	3.93	--	--	--	--
D Rd.	K	54.5	0.10	0.001	0.20	42.5	0.08	0.001	0.16	--	--	--	--
D Rd.	L	1,035.5	1.97	0.021	3.82	807.5	1.53	0.016	2.98	--	--	--	--
Remaining roads[d]	-	1,623.0	1.18	0.032	4.63	1,311.0	0.94	0.026	3.70	608.8	0.44	0.012	1.73
All roads (remedial action)	-	3,092.0	3.73	0.070	10.14	7,244.0	7.15	0.213	18.49	3,054.0	2.60	0.095	6.10
Worker commuting[d]	-	1,073.0	0.77	0.021	3.05	2,263.0	1.62	0.045	6.45	2,245.0	1.62	0.045	6.40
Total	-	4,165.0	4.50	0.091	13.19	9,507.0	8.77	0.258	24.94	5,749.0	4.22	0.140	12.50

Table 5.16 Estimated number of traffic-related injury, fatal, and total accidents by remedial action alternative (Concluded)

Road	Segment[a]	Two Road - truck				Two Road truck/train				Vicinity properties			
		VMT[b] (000's)	Accidents Injury	Accidents Fatal	Accidents Total[c]	VMT[b] (000's)	Accidents Injury	Accidents Fatal	Accidents Total[c]	VMT[b] (000's)	Accidents Injury	Accidents Fatal	Accidents Total[c]
I-70	A	1,513.2	0.53	0.041	1.57	187.2	0.07	0.005	0.19	--	--	--	--
I-70	B	3,604.0	1.26	0.097	3.75	--	--	--	--	--	--	--	--
Loop 70	C	2,040.0	3.12	0.065	15.57	--	--	--	--	--	--	--	--
Loop 70	D	170.0	0.26	0.005	1.30	--	--	--	--	--	--	--	--
U.S. 50	E	--	--	--	--	--	--	--	--	--	--	--	--
U.S. 50	F	--	--	--	--	--	--	--	--	--	--	--	--
U.S. 50	G	--	--	--	--	--	--	--	--	--	-	--	--
U.S. 50	H	--	--	--	--	--	--	--	--	--	--	--	--
State Rt. 146	I	--	--	--	--	--	--	--	--	--	--	--	--
State Rt. 146	J	--	--	--	--	--	--	--	--	--	--	--	--
D Rd.	K	--	--	--	--	--	--	--	--	--	--	--	--
D Rd.	L	--	--	--	--	--	--	--	--	--	--	--	--
Remaining roads[d]	-	5,392.8	3.88	0.128	15.4	4,712.8	3.39	0.094	13.40	--	--	--	--
All roads (remedial action)	-	12,720.0	9.05	0.316	37.51	4,900.0	3.46	0.099	13.59	3,601.0	2.59	0.072	10.26
Worker commuting[d]	-	3,368.0	2.42	0.067	9.60	3,607.0	2.60	0.072	10.28	364.0	0.26	0.007	1.04
Total	-	16,088.0	11.47	0.383	47.19	8,507.0	6.06	0.171	23.87	3,965.0	2.85	0.079	11.30

[a] Segments are described in Table 5.15.
[b] VMT - Vehicle-miles traveled.
[c] Total refers to all property damage accidents and includes injuries and fatal accidents.
[d] Countywide accident rates used.

Disposal at the Cheney Reservoir site with truck transport

Tailings disposal at the Cheney Reservoir site with truck transport would involve approximately 9,507,000 vehicle-miles travelled off the site. A total of 24.94 accidents would be expected to occur as the result of the remedial action related travel. Of those accidents, 0.26 would be expected to be fatal accidents and 8.77 injury accidents.

Disposal at the Cheney Reservoir site with train and truck transport

Tailings disposal at the Cheney Reservoir site with train and truck transport would involve approximately 5,749,000 vehicle-miles of off-site travel on roads in Mesa County. A total of 12.50 accidents would be expected as the result of the remedial action related travel. Of those accidents, 0.14 would be expected to be fatal accidents and 4.22 injury accidents.

An additional 13,000 train-miles would be travelled under this alternative. Applying the Denver and Rio Grande Western railroad accident rate average for 1980 to 1981 (presented in Section 4.12.7 and Appendix K, Socioeconomics and Land Use Information) to the train-miles travelled, a total of 0.20 accidents or incidents would be expected. Of these mishaps, 0.01 would be expected to be fatal accidents and 0.12 injury accidents.

Disposal at the Two Road site with truck transport

Tailings disposal at the Two Road site with truck transport would involve approximately 16,088,000 vehicle-miles of off-site travel. A total of 47.19 accidents would be expected to occur as the result of remedial action related travel. Of those accidents, 0.38 would be expected to be fatal accidents and 11.47 injury accidents.

Disposal at the Two Road site with train and truck transport

Tailings disposal at the Two Road site with train and truck transport would involve approximately 8,507,000 vehicle-miles of off-site travel. A total of 23.87 accidents would be expected as the result of the remedial action related travel. Of those accidents, 0.17 would be expected to be fatal accidents and 6.06 injury accidents.

An additional 29,900 miles of train travel would be involved under this alternative. Applying the Denver Rio Grande Western railroad accident rate averages for 1980 to 1981, a total of 0.47 accidents or incidents would be expected. Of these mishaps, 0.03 would be expected to be fatal accidents and 0.28 injury accidents.

Vicinity properties

Vicinity properties remedial action would involve approximately 3,965,000 vehicle-miles of off-site travel. A total of 11.30 accidents would be expected as a result of the remedial action related travel. Of those accidents, 0.08 would be expected to be fatal accidents, 2.85 injury accidents, and 11.30 total accidents.

5.15.2 Construction accidents

All of the alternatives, except no action, would involve material handling operations and construction activities that could result in accidents causing injury to workers. These hazards would be similar to those encountered in any large earth-moving project, such as open-pit mining and heavy construction. Accordingly, assessments of fatalities and injuries resulting from nontransportation accidents have been developed for each alternative from mining and construction accident data provided by the Bureau of the Census (U.S. Department of Commerce, 1983).

The 1981 accident rates, given in terms of fatalities or injuries per man-year of labor, in the mining and construction industries are presented in Table 5.17. The average accident rates indicated in the table were used in the assessment of accidental injuries and fatalities for each of the remedial action alternatives. The results of the assessment are presented in Table 5.18.

The no action alternative would not result in any fatal or injury accidents. The other alternatives would have similar impacts in terms of the expected numbers of fatal and injury accidents due to comparable labor requirements. The vicinity properties cleanup, requiring approximately 1155 man-years of labor, is expected to result in considerably higher numbers of fatal and injury accidents.

5.16 RELATIONSHIP TO LAND USE PLANS, POLICIES, AND CONTROLS

5.16.1 No action

The no action alternative would result in the permanent exclusion of approximately 114 acres from any alternative land use. The site is outside the city limits of Grand Junction, and, therefore, is subject to Mesa County's land use policies. County policies recommend that new construction be in conformity with the character of the area (Mesa County, 1983). Because the area surrounding the site is zoned industrial, the no action alternative would preclude the acreage occupied by the tailings from being developed according to Mesa County land use policies.

The no action alternative would also preclude the acreage occupied by the tailings from being developed according to the adopted Parks and Recreation Plan of the City of Grand Junction, which designates the land as a future part of the proposed Colorado River Park System (Department of City Planning, 1979).

Table 5.17 Worker fatalities and nonfatal injuries for mining and construction in the United States (1981)

Industry	Fatalities per man-year of labor	Nonfatal injuries per man-year of labor
Mining	0.0005	0.0466
Construction	0.0004	0.0378
Average	0.00045	0.0422

Ref. U.S. Department of Commerce, 1983.

Table 5.18 Estimated worker fatalities and injuries by remedial action alternative[a,b]

Alternative	Total man-years of labor required during remedial action	Fatal accidents	Injury accidents[c]
No action	0.0	0.0	0.0
Stabilization on site	226.1	0.10	9.45
Cheney Reservoir - truck	201.8	0.09	8.52
Cheney Reservoir - train and truck	213.8	0.10	9.02
Two Road - truck	193.9	0.09	8.18
Two Road - train and truck	213.9	0.10	9.03
Vicinity properties	1028.0	0.46	43.38

[a]Excludes fatalities and injuries resulting from transportation accidents. Average fatal and nonfatal accident rates for mining and construction were used to obtain estimates.

[b]Truck drivers are expected to spend only a negligible amount of time out of trucks. Thus, truck driver labor was excluded from labor used in the calculation of construction worker accidents to avoid double counting.

[c]Some degree of physical impairment rendering the person unable to perform for a full day beyond the day of injury.

If no action were taken on affected vicinity properties, any restrictions on future development would depend on actions taken by Federal, state, and local governing bodies and agencies. Any such restrictions would prevent existing land use plans, policies, and controls from being fully implemented. Presently, any applicant for a building permit in Mesa County must certify that the building location is not contaminated or must release the State of Colorado from any liability for cleaning up the site.

5.16.2 Stabilization at the Grand Junction site

Stabilization at the Grand Junction site would preclude 93 acres at the Grand Junction site from being developed for any alternative land use. Therefore, the areas occupied by the stabilized pile could not be developed as part of the proposed Colorado River Park System, according to the Parks and Recreation Plan of the city of Grand Junction. It also could not be used for industrial purposes, which is the predominant land use around the site; thus, county land use policies, which call for development compatible with surrounding areas, could also not be fully implemented.

5.16.3 Disposal at the Cheney Reservoir site with truck or train and truck transport

The relocation of the tailings to the Cheney Reservoir site by truck or by train and truck would make the 114 acres at the Grand Junction tailings site available for development. Therefore, the 114 acres could be used as designated in the City Parks and Recreation Plan as part of the proposed Colorado River Park System. It also could be used for industrial purposes, which is the predominant land use around the site, according to land use policies outlined by Mesa County.

The tailings pile, once stabilized at the Cheney Reservoir site, would preclude 80 acres there from any alternative land use. The Cheney Reservoir site, owned by the Federal Government, is currently designated for the grazing of cattle and has an existing oil and gas lease. Relocation of the tailings to the Cheney Reservoir site would require BLM approval of a land withdrawal application.

5.16.4 Disposal at the Two Road site with truck or train and truck transport

The relocation of the tailings to the Two Road site by truck or by train and truck would make the 114 acres at the Grand Junction site available for development. Thus, the 114 acres could be used as designated in the City Parks and Recreation Plan as part of the proposed Colorado River Park System. It could also be developed for industrial use according to Mesa County land use policies.

The tailings pile, once stabilized at the Two Road site, would preclude 80 acres from any alternative land use. The Two Road site, owned by the Federal Government, is currently designated for the grazing of sheep and has several oil and gas leases. Relocation of the tailings to the Two Road site would require BLM approval of a land withdrawal application. Use of the site for tailings disposal would preclude use of the site for the Glenwood-Dotsero project.

5.16.5 Vicinity properties

Remedial action at the vicinity properties would free all such properties from any development restrictions due to the presence of contaminated material. Thus, local land use plans, policies, and controls could be fully implemented once remedial action was complete.

5.16.6 Potential for co-disposal with the Grand Junction Area Office waste and with other low-level radioactive waste

Members of the public have asked DOE whether the site selected for the disposal of the Grand Junction tailings would be used to dispose of other low-level radioactive tailings. These questions have been raised regarding planned disposal activities of the DOE GJAO, and the State of Colorado plan to select a site for the disposal of low-level radioactive waste (primarily waste from hospitals) under the Interstate Compact between New Mexico, Wyoming, and Nevada. The U.S. Environmental Protection Agency (EPA) has also expressed some interest in using the UMTRA Project disposal site to dispose of the radioactively contaminated material from cleanup, under Superfund, of the "Denver radium site."

As described in Section 1.2 and elsewhere, and since publication of the DEIS, DOE is considering co-disposal of the waste from DOE's GJAO with the tailings from the former mill site. DOE is preparing a separate environmental assessment (EA) for remdial action at the GJAO site. DOE's decision regarding the disposal site, with discussion of permitting requirements, will be presented in the EA for the GJAO site. Presently there are no firm proposals to use the site selected for the disposal of the Grand Junction tailings for the disposal of the other low-level radioactive materials described above. However, the Grand Junction disposal sites are under consideration for this use as are other UMTRA Project disposal sites in Colorado and numerous sites that are not related to the UMTRA Project.

DOE has stated that they may allow UMTRA Project disposal sites to be used for the disposal of other low-level radioactive waste so long as the longevity, costs, and schedule for the UMTRA Project site are not impacted.

DOE will not allow other low-level radioactive wastes to be mixed with the UMTRA Project tailings in the same pile but may allow other low-level radioactive waste to be placed at an UMTRA Project site, if the conditions described above were met.

In summary, it is possible that the site selected for the disposal of the Grand Junction tailings may at some time in the future be selected for the disposal of other low-level radioactive waste if the conditions described above are met. However, many sites are under consideration for this activity and there are presently no firm proposals to use the Grand Junction site or the alternate disposal sites for this use.

5.17 UNAVOIDABLE ADVERSE IMPACTS

Conservative but realistic assumptions and impact assessment procedures have been used to estimate the impacts identified in this EIS. Therefore, these impacts represent a realistic upper limit on the severity of the impacts and the actual impacts caused may be less than those identified in this document.

No action

The primary adverse impact of the no action alternative would be the continued health hazard to the public from exposure to radon and its daughter products. The tailings pile and the vicinity properties would continue to cause exposures which exceed EPA standards. An estimated 400 and 1000 cancer deaths would occur over the next 1000 years from the tailings pile and vicinity properties, respectively, if this alternative were implemented. The tailings would continue to be subject to wind and water erosion which would result in a continuously expanding area unsafe for human use. In addition, the 114 acres which comprise the tailings site and adjacent State Repository would be unavailable for productive land uses such as recreational or industrial development.

Stabilization at the Grand Junction site

The primary adverse impact of this alternative would be the permanent restriction of 93 acres of land adjacent to the city of Grand Junction from productive land uses such as recreational or industrial development. This alternative would also cause temporary increases in noise and airborne dust in the vicinity of the Grand Junction site for approximately three years. The release of dust would exceed Federal and state standards. The tailings pile would extend 55 to 71 feet above the ground and would be a visual annoyance to some persons. Remedial action workers would be exposed to above-background levels of radiation and the possibility of construction related accidents.

Disposal at the Cheney Reservoir site with truck transport

The primary adverse impacts of this alternative would be increases in traffic within Grand Junction and on the major north/south highway serving Grand Junction. An increase in traffic accidents and fatalities as well as possible traffic congestion would result. This alternative would also cause temporary increases in noise and airborne dust in the vicinity of the Grand Junction site and the Cheney Reservoir site for approximately three years. The releases of dust would exceed Federal and state standards. Approximately 62 acres of the Cheney Reservoir site would be withdrawn from the existing use as low density grazing land. Remedial action workers would be exposed to above-background levels of radiation and the possibility of construction related accidents.

Disposal at the Cheney Reservoir site with train and truck transport

The adverse impacts of this alternative would be similar to disposal at the Cheney Reservoir site with truck transport (discussed above) except that there would be fewer traffic impacts (accidents and congestion). An additional impact would be temporary increases in noise in the vicinity of Whitewater.

Disposal at the Two Road site with truck transport

The primary adverse impact of this alternative would be increases in traffic within Grand Junction and on the major east/west highway serving Grand Junction. An increase in traffic accidents and fatalities as well as possible traffic congestion would result. This alternative would also cause temporary increases in noise and airborne dust in the vicinity of the Grand Junction site and the Two Road site for approximately three years. Approximately 62 acres of the Two Road site would be withdrawn from the existing use as low density grazing land. Remedial action workers would be exposed to above-background levels of radiation and the possibility of construction related accidents.

Disposal at the Two Road site with train and truck transport

The adverse impacts of this alternative would be similar to disposal at the Two Road site with truck transport (discussed above) except that there would be far less traffic impacts (accidents and congestion). An additional impact would be temporary increases in noise in the vicinity of Mack.

Vicinity properties

All of the action alternatives include remedial action at the vicinity properties. The primary impacts of remedial action at the vicinity properties would be temporary increases in noise at the vicinity properties for an average of one month for each of the vicinity properties. Some residents might have to be relocated for a short period of time and some businesses may have to be closed for a short period of time.

5.18 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Alternative 1 does not require the use of any resources.

Alternatives 2 through 6 would require the same types of resource commitments. These include engine fuel, electricity, borrow material, manpower, water, and land. The only resources which would be irretrievably lost are engine fuel, electricity, and manpower. The amounts of the resources lost are identified in Sections 5.10 and 5.14.

The use of water would not be a permanent commitment of the resource since it would be released into the environment following treatment. Even the use of borrow materials, and the land in general, would not necessarily be permanently committed. The uranium and vanadium resources within the tailings would not be lost since the tailings could be excavated and the uranium and vanadium recovered, if permitted by law.

The commitment of land for long-term stabilization of the tailings and the potential ground-water impacts discussed in Section 5.5 would represent irreversible and irretrievable commitments of resources.

5.19 RELATIONSHIP BETWEEN SHORT-TERM USE OF THE ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Under Alternative 1, no action, there would be no short-term use of the environment. The long-term productivity of the Grand Junction site would continue to be restricted because the unstabilized tailings would remain on the site. A continuously enlarging area would be contaminated by wind and water erosion of the tailings and associated restrictions on the use of the newly contaminated areas may be imposed.

Under Alternative 2, stabilization at the Grand Junction site, there would continue to be restricted use of the Grand Junction site for a period of approximately three years. In addition, the construction activities at the Grand Junction site, vicinity properties, transportation routes, and borrow sites would cause temporary inconveniences such as noise, increased traffic, and dust during daytime hours. Following remedial action, the area of restricted use would be reduced from the 114 acres that presently exist to 93 acres. The net increase in productive land would increase from nearly zero to 21 acres.

Under Alternatives 3 through 6, the relocation alternatives, there would continue to be restricted use of the Grand Junction site for a period of approximately three years. In addition, the construction activities at the Grand Junction site, vicinity properties, transportation routes, borrow sites, and alternate disposal sites would cause temporary inconveniences such as noise, increased traffic, and dust during normal work hours. Following remedial action, the Grand Junction site would be released for any use consistent with local land use plans; however, 80 acres at the alternate disposal site would be permanently restricted from any other uses. Since the potential productivity of the Grand Junction site for recreation or industrial development is far greater than the potential productivity of the alternate disposal sites (low-density grazing only), the net long-term productivity of lands would be enhanced.

5.20 MITIGATIVE MEASURES

5.20.1 Mitigative measures

Mitigative measures have been included in all of the remedial action alternatives to reduce the impacts on the environment. The following are the primary mitigative measures that have been included in the remedial action alternatives.

<u>Mitigative measures included in all alternatives</u>

- o Application of water to disturbed areas at the Grand Junction site and the alternate disposal sites to inhibit dust emissions.

- o Application of water and chemical dust suppressants to dirt and gravel haul roads to inhibit dust emissions.

- o Construction of an earthen cover to inhibit radon emanation (consistent with EPA standards) and surface-water infiltration.

- o Construction of a rock cover on the stabilized tailings to ensure that the stabilized pile could withstand the erosive effects of a Probable Maximum Precipitation (PMP).

- o Use of local labor whenever possible to reduce the sociological impacts to the local communities and maximize economic benefits.

- o Covering of haul trucks and/or train cars to prevent dispersion of tailings during relocation.

- o Construction of surface runoff diversion channels to direct runoff away from the stabilized tailings and prevent long-term erosion.

- o Design of the stabilized tailings to withstand a Maximum Credible Earthquake (MCE).

- o Selection of borrow sites which are as close to the disposal sites as possible to reduce costs and minimize the impacts of long haul distances.

- o Reclamation, including filling, grading, and revegetating of borrow sites (as required) and all other areas disturbed during operations except the stabilized tailings and access roads.

- o Treatment of any water to be discharged in accordance with appropriate state and Federal standards.

- o Use of existing borrow sites for general fill and rock where possible to reduce the amount of land disturbance associated with the project.

- o Implementation of an environmental monitoring program during remedial action.

- o Removal of all contaminated soils (consistent with EPA standards) adjacent to and beneath the existing tailings pile and consolidation of the contaminated soils with the tailings.

- o Stockpiling of various soils encountered at the borrow sites for future use during reclamation.

- o Immediate cleanup of any off-site spills.

- o Construction of a complex cover design and access barriers for the tailings piles to prevent inadvertent human intrusion after remedial action.
- o Use of functional and properly maintained mufflers on all construction equipment and vehicles, and scheduling of haul trips to take place within daylight hours, according to state and local regulations, to reduce noise disturbance to local residents.
- o Construction of temporary erosion control berms and retention pond(s) to prevent dispersal of tailings by runoff during remedial action.
- o Maintaining close communications with the local population through an established public information task force.
- o Cleanup of the equipment (e.g., trucks) used before releasing it for use on other projects to prevent the spread of contaminated materials.
- o Construction of fences or other access barriers to inhibit unauthorized human intrusion.
- o Upgrading of haul roads with traffic lights and passing lanes (if necessary) to reduce the potential for traffic accidents and congestion.

The following mitigative measures were incorporated into the individual remedial action alternatives.

Disposal at the Grand Junction site

- o Construction of a thick layer of rock armor around all sides of the pile to protect it against erosion from a Probable Maximum Flood (PMF).
- o Consultation with BLM in the selection of a borrow site in Unaweep Canyon that will minimize impacts.

Disposal at the Cheney Reservoir site with truck transport

- o Use of separate haul routes for in-bound and out-bound trucks in and around Grand Junction to reduce the potential for traffic congestion.
- o Upgrading haul routes with traffic lights and passing lanes (as necessary) to reduce the potential for traffic accidents and congestion.
- o Release of the Grand Junction site, after reclamation of the site, for any use compatible with local land use plans.

Disposal at the Cheney Reservoir site with train and truck transport

- o Use of trains to transport the tailings to Whitewater to reduce the potential for traffic accidents and congestion in and around Grand Junction.
- o Use of covered loading and off-loading structures for the rail cars to inhibit the release of dust.
- o Release of the Grand Junction site, after reclamation of the site, for any use compatible with local land use plans.

Disposal at the Two Road site with truck transport

- o Upgrading haul routes (as necessary) to reduce the potential for traffic accidents and congestion.
- o Release of the Grand Junction site, after reclamation of the site, for any use compatible with local land use plans.

Disposal at the Two Road site with train and truck transport

- o Use of trains to transport the tailings to Mack to reduce the potential for traffic accidents and congestion in and around Grand Junction.
- o Use of covered loading and off-loading structures for the rail cars to inhibit the release of dust.
- o Release of the Grand Junction site, after reclamation of the site, for any use compatible with local land use plans.

5.20.2 Worker protection during remedial action

Training sessions applicable to the degree of radiation hazards present at the site will be conducted for all employees prior to the start of work. These sessions would include discussion of the industrial and radiological safety procedures, emergency procedures, and the effects of prenatal radiation exposure. Records would be maintained which document successful completion of training by employees.

Controlled areas would be designated and conspicuously marked. Access to these areas would be restricted, and all personnel and equipment would be monitored for contamination. Access control records would be maintained. Those records would include a log of personnel and equipment entering and leaving the restricted area and a log of dosimeters issued.

Protective clothing would be distributed to employees at the access control point when conditions warrant. Change and cleanup facilities would be provided.

Thermoluminescent dosimeters (TLDs) or film badges would be supplied to permanent employees working in controlled areas. Dosimeters would be changed quarterly or more frequently if necessary. Urinalysis would be used to monitor employees' internal exposures where potential ingestion of radioactive material is indicated by air sampling data. Additional dosimetry might be required if positive results were noted. A system of employee health records would be maintained which documents individual radiation exposures and the results of personnel dosimetry and bioassays.

Air particulate samples would be collected in work areas and at site boundaries. Samples would be analyzed for gross alpha levels, and would be stored for later isotopic analyses, if necessary. Additional samples would be collected in work areas where ventilation was limited, and analyzed for radon daughter concentrations.

A respiratory protection program would be developed by the Remedial Action Contractor (RAC), with procedures developed for training employees and checking for adequate fit of respirators. Respirators would be used in work areas where air particulate concentrations exceeded a projected monthly concentration of 25 percent of the regulatory limit for a given radionuclide. Industrial hazards would be controlled in accordance with OSHA regulations.

Additional details of the health and safety plan will be available in the Remedial Action Plan/Site Conceptual Design which will be prepared following the selection of a preferred alternative.

5.21 SURVEILLANCE AND MAINTENANCE

Title I of the UMTRCA defines the authority and roles of the U.S. Department of Energy (DOE), the Nuclear Regulatory Commission ("Commission"), and the intent of licensing regarding inactive tailings sites in the various states. In part, Section 104(f)(2) of the UMTRCA reads:

> "...upon completion of the remedial action program...(the site) shall be maintained pursuant to a license issued by the Commission in such manner as will protect the public health, safety, and the environment. The Commission may, pursuant to such license or rule or order, require...monitoring, maintenance, and emergency measures necessary to protect public health and safety and other actions as the Commission deems necessary to comply with the standards (EPA) of Section 275..."

Accordingly, the remedial action must demonstrate compliance with the EPA standards (40 CFR Part 192) and thus, the prime objective of licensing is to ensure continued compliance with the EPA standards via a post-remedial action surveillance and maintenance program.

DOE would conduct the surveillance and maintenance pursuant to the requirements of the Commission's license until termination of the UMTRA Project (i.e., March 7, 1990). At that time, the DOE or another agency to be designated by the President would maintain the site as required by the Commission.

A detailed custodial surveillance and maintenance program would be defined jointly by the DOE and the Nuclear Regulatory Commission (NRC) during the NRC license application and approval process. This program may include any or all of the following activities.

Site inspections

Site inspections would constitute a visual and definitive verification that the disposal site continues to function as designed and would assure continued compliance with the design standards. Inspections would consist of two phases: Phase I, a systematic walk-over, is designed to qualitatively evaluate the condition of the disposal site; Phase II would constitute investigations to quantitatively assess changes in the disposal site that could lead to failure of the functional design in the absence of custodial maintenance. The Phase I inspections would be conducted on a specific schedule, such as annually, by a team of qualified professionals. The inspection team would review as-built drawings, engineering details, aerial photographs, and supporting documentation. A site walk-over would then be performed to evaluate any changes at the site with regard to factors such as erosion, flood effects, slope/cover stability, settlement, displacement, plant or animal intrusion, and access control.

Based upon the evaluation and recommendations of the inspection team, Phase II studies might be conducted to quantitatively determine the magnitude and rate of effect of change in the above factors. From these studies, the need for a corrective action (i.e., custodial maintenance) would be ascertained.

Aerial photography

Aerial photography might be used to supplement site inspections. The objectives might be to identify changes in site conditions (e.g., patterns of developing erosion that could affect the functional design), provide visual documentation of year-to-year variations in site conditions, and to identify activities (e.g., road conditions, storm drainage construction) adjacent to the site that might affect its function.

Aerial photography might be conducted on the same schedule as the site inspections. Photographs would be taken at both low (i.e., high resolution) and higher (i.e., for adjacent activities) altitudes, and at oblique and vertical angles. The types of film, ground control, camera specifications, amount of aerial overlap, interpretative keys, and other requirements would be established prior to completion of remedial action.

Ground-water monitoring

Certain existing wells may be preserved during construction for use as monitoring wells after completion of the remedial action. In addition to these wells, a series of both shallow and deep wells might be installed for the purpose of monitoring ground-water quality. The locations for these wells would be selected in order to monitor the performance of the disposal site. Details of the ground-water monitoring would be developed during the NRC licensing process.

Reporting

Summary surveillance and monitoring reports that evaluate the results of these activities and recommend custodial maintenance (i.e., corrective actions) and future surveillance and monitoring would be prepared. Reports and supporting documentation would be placed on file with DOE, NRC, the State of Colorado, and Mesa County.

Custodial maintenance

The need for custodial maintenance (i.e., corrective action) could only be determined by the site inspections and monitoring and by NRC and DOE evaluation of the reports of these activities. However, it is anticipated that custodial maintenance would consist primarily of the following:

- Limited earth/rock replacement because of unanticipated erosion, human or animal intrusion, or cover disturbance. These activities are expected to be required infrequently.
- Control of deep-rooted plants by infrequent application of herbicides or physical removal as required.
- Mechanical repairs to the access barrier, gates and locks, and warning signs, when necessary.

Contingency plans

In case of severe natural events (e.g., extreme rainfall or seismic events) or unusual human intrusion, procedures would be developed to initiate inspection and to institute custodial maintenance of the disposal site.

REFERENCES FOR SECTION 5.0

Bolwahnn, F. L., 1983. U.S. Fish and Wildlife Service, Salt Lake City, Utah, personal communication with James A. Morley, U.S. Department of Energy, UMTRA Project Office, Albuquerque Operations Office, Albuquerque, New Mexico.

Carmen, Bob, 1985. Engineering Supervisor, Mesa County Road Department, Grand Junction, Colorado, personal communication to Mark Pingle, Jacobs Engineering Group Inc., Pasadena, California.

Cohen, B.L., 1981. "Proposals on Use of BEIR III Report in Environmental Assessments," Health Physics, Vol. 41, pp. 769-774.

Colorado Department of Health, 1981. Fugitive Dust Emissions, Air Pollution Control Division, Denver, Colorado.

Colorado Department of Highways, 1985. Accidents and Rates on State Highways; 1981, 1982, and 1983, Denver, Colorado.

Colorado Department of Highways, 1981. Colorado State Highway Sufficiency Rating Study, Denver, Colorado.

Davis, S.N., and R.J.M. DeWiest, 1965. Hydrogeology, John Wiley and Sons, Inc., New York, New York.

Department of City Planning, 1979. Parks and Recreation Facilities - Master Plan, Grand Junction, Colorado.

DOE (U.S. Department of Energy), 1986. "Biological Assessment for the Two Road Alternative Disposal Site at the Former Climax Uranium Company Uranium Mill Site, Grand Junction, Mesa County, Colorado", prepared by the U.S. Department of Energy, UMTRA Project Office, Albuquerque Operations Office, Albuquerque, New Mexico.

DOE (U.S. Department of Energy), 1984. Remedial Actions at the Former Uranium Corporation of America Uranium Mill Site, Durango, La Plata County, Colorado, prepared by the U.S. Department of Energy, UMTRA Project Office, Albuquerque Operations Office, Albuquerque, New Mexico.

DOE (U.S. Department of Energy), 1983a. Unpublished reports prepared by NUS Corporation, Aurora, Colorado, under contract to Sandia National Laboratories, Albuquerque, New Mexico (Contract No. 68-3473), for the U.S. Department of Energy, UMTRA Project Office, Albuquerque Operations Office, Albuquerque, New Mexico.

DOE (U.S. Department of Energy), 1983b. "Biological Assessment related to Remedial Action at the Grand Junction and Rifle Sites," prepared by the U.S. Department of Energy, UMTRA Project Office, Albuquerque Operations Office, Albuquerque, New Mexico.

Dufour, P.A., 1980. "Effects of Noise on Wildlife and Other Animals, Review of Research Since 1971," EPA 550/9-80-100, Office of Noise Abatement and Control, U.S. Environment Protection Agency, Washington, D.C.

EPA (U.S. Environmental Protection Agency), 1983. Regional Workshops on Air Quality Modeling; A Summary Report, EPA, Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina.

EPA (U.S. Environmental Protection Agency), 1982. Compilation of Air Pollutant Emission Factors, AP-42, revised through Supplement 12, Washington, D.C.

EPA (U.S. Environmental Protection Agency), 1979. "Mobile Emission Factors," PB-295 672, Washington, D.C.

FBDU (Ford, Bacon, & Davis, Utah,Inc), 1981. Engineering Assessment of Inactive Uranium Mill Tailings, Grand Junction Site, Grand Junction, Colorado, November, 1982, prepared by FBDU, Salt Lake City, Utah, for the U.S. Department of Energy, UMTRA Project Office, Albuquerque Operations Office, Albuquerque, New Mexico.

Javandel et al. (I. Javandel, C. Doughty, and C. Tsang), 1984. Ground water Transport: Handbook of Mathematical Models, American Geophysical Union, Washington, D.C.

Kenney, J., 1985. Public Works Operation Superintendent, Grand Junction, Colorado, personal communication to Mark Pingle, Jacobs Engineering Group Inc., Pasadena, California, dated May, 1985.

Kessler et al. (F.M. Kessler, P.D. Schomar, P.C. Shanaud, and E. Rosendahl), 1978. Construction Site Noise Control Cost-Benefit Estimation Technical Background, prepared by the U.S. Army Corps of Engineers, Construction Engineering Research Laboratory Technical Report N-37, Champaign, Illinois.

Mesa County Assessor, 1985. Personal communication from the Mesa County Assessor's Office, Grand Junction, Colorado, to Mark Pingle, Jacobs Engineering Group Inc., Pasadena, California, April, 1985.

Mesa County, 1983. 1983 Land Use and Development Policies; Mesa County, Colorado, Mesa County Planning Commission, Grand Junction, Colorado.

NAS (National Academy of Sciences), 1980. "The Effects on Population of Exposure to Low Levels of Ionizing Radiation," BEIR III, National Research Council, Advisory Committee on Biological Effects of Ionizing Radiation, Washington, D.C.

NRC (U.S. Nuclear Regulatory Commission), 1981. A Computer Program for Calculating Environmental Radiation Doses from Uranium Recovery Operations, Washington, D.C., NUREG/CR-2011, April, 1981.

PAS (Planning and Assessment System), 1985. "Economic and Demographic Projections," State of Colorado Division of Local Government, Department of Local Affairs, Demographic Section, Denver, Colorado.

Razga, Ron, 1984. United Bank of Grand Junction, Grand Junction, Colorado, personal communication to Chris Nagel, Jacobs Engineering Group Inc., Pasadena, California, dated May, 1985.

Swing, J.W., 1975. Estimation of Community Noise Exposure in Terms of Day-Night Average Level Noise Contours, California Department of Public Health, Office of Noise Control.

Trainor, Charles, 1985. Transportation Planner, Mesa County Policy and Research Office, Grand Junction, Colorado, personal communication to Mark Pingle, Jacobs Engineering Group Inc., Pasadena, California, dated May, 1985.

U.S. Department of Commerce, 1983. Statistical Abstracts of the U.S., 1981 to 1982, Bureau of the Census, Washington, D.C.

6.0 PUBLIC AND AGENCY COMMENTS

6.1 INTRODUCTION

This section discusses the comments made by private citizens, organizations, and government agencies (Federal, state, and local) on the DEIS for remedial actions at the former Climax Uranium Company uranium mill site in Grand Junction, Colorado.

Comments on the DEIS were obtained from the public, citizen's groups, and government agencies during two public hearings and a 46-day[a] written comment period. Two public hearings were held in Grand Junction, Colorado, on May 6, 1986. A total of 11 persons presented oral statements on the DEIS. Written comments were received from 17 individuals or organizations during the written comment period. Table 6.1 lists the persons, groups, or agencies that presented oral statements at the public hearings or that submitted written comments.

To put all the comments in an easily accessible form, each oral statement (recorded by a certified stenographer) and letter was analyzed in detail to identify specific issues. A preliminary outline of this chapter was then prepared based on these issues. Notebooks were prepared in which all comments on a specific topic (e.g., ground water) were consolidated. This system allowed the preparers of the FEIS to consider all comments received on a topic while revising the sections of the FEIS dealing with that topic.

As a result, comments have been grouped into 22 major topics that cover all the substantive comments received. Each of these topics deals with one or more issues which are listed in this section as part of the discussions of the 22 topics. Where the responses required changes in the text of the DEIS, they appear in the main text of this FEIS. For example, the Department of the Interior expressed concern regarding the impacts to riparian habitat. In responding to this comment, the DOE conducted a radiological survey and found that only a small area of riparian habitat would be impacted; Appendix G, Floodplain and Wetlands Assessment, has been modified to reflect this new knowledge.

---

[a]The EPA Notice of Availability was published in the Federal Register on April 17, 1986 (Vol. 51). The DEIS underwent distribution on March 28, 1986. Although the formal comment period lasted 46 days (April 17 through June 2, 1986), the DOE received and considered comments until July 31, 1986.

Table 6.1 Index of persons submitting written comments or providing oral testimony at the public hearings

Index Number	Name	Affiliation	Origin-letter (L) or hearing (H)
1.	John Whiting	Citizen of Mesa County	H
2.	Victor J. Thompson	Citizen of Mesa County	H
3.	Ruth P. Hutchins	Citizen of Mesa County	H
4.	Chris Jouflas	Citizen of Mesa County	H
5.	John Thomas	Citizen of Mesa County	H
6.	Al Tschaeche	Citizen of Mesa County	H
7.	M. O. Brown	Mesa County Dominguez Reservoir Advisory	H
8.	Martin Garber	Citizen of Mesa County	H
9.	Tallie Miller	Mesa County Planning Commission	H
10.	Virginia Nelson	Citizen of Mesa County	H
11.	Pat Tomlinson	Citizen of Mesa County	H
12.	Randy Booth	Central Grand Valley Sanitation District	L
13.	Art Champ	U.S. Department of the Army, Corps of Engineers	L
14.	Robert Matuschek	U.S. Department of Housing and Urban Development	L
15.	John Schmahl	Mesa Rock Company	L
16.	Louis Brach	Dominguez Dam Project	L
17.	Willis Strong	Citizen of Mesa County	L
18.	Doris Butler	Citizen of Mesa County	L
19.	Cindy Richardson	Citizen of Mesa County	L
20.	Robert Holmes	Grand Junction UMTRA Project Task Force	L
21.	Paul Klite	Citizen of Mesa County	L
22.	Connie Albrecht	Friends of the Earth	L
22.	John Thomas	Sierra Club	L
23.	Gilbert Wenger	Citizen of Mesa County	L
24.	J. Don Newton	City of Grand Junction	L
24.	Greg Flebbe	City of Grand Junction	L
25.	Bruce Blanchard	U.S. Department of Interior	L
26.	Paul Ferraro	Colorado Department of Health	L
27.	Milton W. Lammering	U.S. Environmental Protection Agency	L
28.	Edward F. Hawkins	U.S. Nuclear Regulatory Commission	L

Sections 6.2 and 6.3 dicuss the legal basis of the proposed remedial action and the choice of alternatives. Sections 6.4 through 6.7 discuss design issues, costs, modes and routes of transportation, and potential borrow sites. Sections 6.8 through 6.19 discuss the various environmental components. Sections 6.20 through 6.24 review regulatory compliance, vicinity properties, long-term site surveillance, public participation, and miscellaneous issues. Finally, Section 6.25 discusses comments outside the scope of the EIS and contains an Errata Sheet.

Section 6.26 of this FEIS reproduces in full the written comments received on the DEIS. Transcripts of the public hearings are available for inspection at each of the public reading rooms and libraries listed at the beginning of Section 6.26. Numbers in the margins of written comments indicate the location in Section 6.0 where the issue is discussed and the specific comment number.

6.2 COMPLIANCE WITH NEPA AND EPA STANDARDS

The compliance of the DEIS with the National Environmental Policy Act (NEPA), particularly in regard to the inclusion of the no action alternative, the demonstration of compliance with the EPA standards, and the issue of co-location of the tailings with other radioactive waste was commented on in several statements. The comments and responses are summarized below.

1. Comment

Alternative 1 (No action) is not acceptable because it is located in an urban area and lies within the 100-year floodplain. It does not address the potential health hazards associated with uranium mill tailings (20).

Response

As indicated in Sections 1.2 and 3.2.2 of this FEIS, Alternative 1 (No action) is unacceptable because its selection ". . . would not be consistent with the intent of Congress in UMTRCA (PL95-604) and would not result in DOE's compliance with the EPA standards (40 CFR Part 192)." This alternative is included in the EIS in order to comply with the requirements of the NEPA and to provide a basis from which to compare estimated environmental impacts of the remedial action alternatives.

2. Comment

The EIS is flawed when it says in Alternative 1 that there were going to be so many cancer deaths from people living in the houses where the tailings have not been removed when, in fact, those tailings will be removed (6).

Response

The commentor is correct in that vicinity properties will be cleaned up. As noted in response 1, the health effects calculated for the no action alternative are for comparative purposes; 1010 cancer fatalities in 1000 years for no action versus no cancer fatalities after remedial action (see Table 1.1).

3. <u>Comment</u>

We request the FEIS develop a point rating system for the alternatives which includes geotechnical, environmental, socioeconomic, and transportation concerns as well as costs (22).

<u>Response</u>

The DOE believes that a point rating system that would be acceptable to a majority of interested parties would be difficult to develop. Further, such a rating system would provide little additional benefit to evaluating alternatives over that provided in Table 1.1. This table summarizes the major impacts and costs for each alternative.

4. <u>Comment</u>

The DEIS on the Grand Junction site is notable from the standpoint of clear and readable narrative. The appendices were useful and provided excellent technical information on the whole. Generally the DEIS exhibits a positive and significant evolution of analysis over earlier documents on the UMTRA Project and the Grand Junction site (22).

<u>Response</u>

No response required.

5. <u>Comment</u>

The EPA's intent during rulemaking and adoption of standards was an affirmative requirement that UMTRA Project sites meet the 1000-year timeframe. It does not allow DOE to use the 200-year timeframe as a maximum goal, or for any case it sees fit, or to reduce the cost of the project. The FEIS must provide more assurance that the 1000-year timeframe can be met by the proposed action (22).

<u>Response</u>

The DOE agrees with the commentor's observation that the intent of the EPA's standards is to meet the 1000-year timeframe. To that end, the conceptual designs for all alternatives have included features to withstand maximum, credible natural events such as the Probable Maximum Precipitation event and a Maximum Credible Earthquake. Sections B.2.6, B.3.7, and B.4.7 of the DEIS describe these natural events and protective design features. Refinements to the conceptual design features will be made during final design. Thus, although these events are not time-dependent, the DOE believes that the conceptual designs are more than adequate to meet the 1000-year standard.

6. Comment

While the DOE has repeatedly said that this EIS will not consider the possible co-location of other low-level radioactive materials with the Grand Junction UMTRA Project repository, it remains an issue of grave concern. The Denver Radium Waste, the Rocky Mountain Compact low-level radioactive waste site, and the uranium mill tailings at the Grand Junction DOE compound are all low-level wastes which could potentially be co-located at the UMTRA Project repository at some point in the future.

The FEIS must consider the additional impacts of co-location of any and all of the above waste sources with the UMTRA Project repository. Specifically, the cumulative, long-term impacts of such co-location must be addressed. There is a precedent for such analyses under NEPA, and such consideration of cumulative impacts from separate projects was included in EISs for oil shale projects in the region, even though the projects were being built by different companies at differing times in the future (3, 11, 20, 22).

Response

The DOE acknowledges the expressed concerns and agrees that wastes could potentially, at some unspecified time in the future, be co-located with the Grand Junction tailings. At this time, it is the DOE's intention to co-dispose only the tailings from the DOE compound in Grand Junction with the tailings from the Grand Junction UMTRA Project site. Accordingly, Sections 1.2, 3.2.10, 3.4.3, 5.0, and 5.16.6 of this FEIS have been modified. Given the low volume of similar compound tailings (80,000 cy) versus the much larger tailings volume (3.1 million cy), and the conservative impacts estimates in the EIS, the impacts in Section 5.0 have not been modified. In addition, since co-location of the Denver radium wastes or wastes from the Rocky Mountain Compact are merely a potential rather than a planned activity, estimation of cumulative impacts is not warranted.

7. Comment

The no action alternative has been, and continues to be, unacceptable to our organizations. The environmental community, both locally and nationally, supported the passage of the UMTRCA because of our belief that uranium mill tailings constitute a significant public health hazard and environmental contaminant. As cited in the DEIS, the no action alternative would not meet the intent of Congress (22).

Response

Agreed. Please see response 1.

8. Comment

The disposal of radioactive material at the Cheney Reservoir site was not addressed in BLM's existing planning documents. Neither the existing management framework plans (MFPs) nor the final resource management plan (RMP) for the Grand Junction Resource Area contemplated this type of land use; therefore, the planning documents must be amended before the withdrawal action can be approved. BLM intends to rely on this EIS as NEPA compliance for the required MFP/RMP amendment if the Cheney Reservoir site is selected; the EIS should contain an explicit statement to the effect that both the MFP/RMP amendment and action on the withdrawal application are part of the Federal action analyzed in the document (25).

Response

Such a statement has been incorporated into the cover sheet of the FEIS.

9. Comment

Extending the program for four years or more will not necessarily decrease the intensity. Intensity will be on a high level on the front end of the project for a given period. The contribution from vicinity properties will extend the project for many months after the intensive hauling has been completed (26).

Response

The commentor is correct in stating that the intensity of impacts will vary depending upon the year of remedial action, time of year, specific activity, and many other factors. However, on the average and assuming that vicinity properties are remediated on the same schedule as the mill site, extension of the schedule would ". . . decrease the intensity and increase the duration of many of the environmental impacts . . ." (Section 1.4).

10. Comment

Based on the information presented in the DEIS, we have concluded the implementation of the proposed remedial plan for relocation of tailings to either the Cheney Reservoir or Two Road sites should produce compliance with the EPA standards for stabilized pile longevity, radon emissions, and ground-water protection. Despite the general environmental acceptability of both relocation sites, the Two Road site seems to have several advantages. That is, Two Road offers a somewhat more remote location, an absence of a continuous ground-water resource, no degradation of scenic values, and slightly less impacted acreage. The significant disadvantage is increased cost (approximately $20 million). Compliance with EPA standards and substantially lower cost do seem to be sound basis for designation of the Cheney Reservoir site as the preferred option.

Considering the overall adequacy of the proposed remedial plan, the identification of two acceptable relocation sites, and the criteria established by EPA to rate adequacy of draft EISs, this draft EIS is rated Category LO (lack of objections) (27).

Response

No response required.

6.3 ALTERNATIVES

Several commentors addressed their preferences for various alternatives and requested additional alternatives.

1. Comment

The stabilization on site (SOS) alternative is unacceptable to our organizations. The DEIS cited that an estimated 20 cancer deaths would result from SOS, which is 10 times greater than disposal at an alternate site. For this reason alone it can never be elevated to a preferred alternative or proposed action. The DEIS assumes that an engineering solution for SOS is possible, ie. that it could meet radon emission standards and gradually reduce the aquifer and surface water pollution. In our view, there simply are not the data in the DEIS to support this conclusion, nor is there experience with stabilization of such a massive uranium mill tailings site on which to base such an expectation. Lastly, the majority of citizen input during the NEPA process to date has supported the removal of the tailings to a repository. Reasons cited have dwelled on the health impacts of allowing such a site in a population center to concerns with contamination of the Colorado River; property values; and community image. In summary, the stabilization on site alternative should not even be considered a serious and viable alternative (22).

Response

The DOE believes that the conceptual design described in the EIS for Alternative 2 (SOS) clearly will meet the EPA standards. Although it is not the preferred alternative, it is included in the FEIS for comparative purposes.

2. Comment

In summary, the comprehensive long-term impacts, as well as possibly some short-term impacts, are clearly greater at the Cheney Reservoir site. Unless these impacts can be conclusively disproven by new data, we request that in the Final EIS:

- o Two Road be elevated to the preferred alternative.
- o Cheney Reservoir be retained as a suitable alternative.
- o Additional alternatives be added--that is, all rail transport to both Cheney and Two Road be fully analyzed (22).

Response

The DOE disagrees with the commentor's summary statement. As evidenced by the analyses of Section 5.0 and as summarized in Table 1.1, impacts from remedial action at the Cheney Reservoir site are very similar to, rather than "clearly greater" than, those from remedial action at the Two Road site. Since the environmental impacts are so similar, and the costs of remedial action at Cheney Reservoir are significantly less, Cheney Reservoir is the DOE's preferred alternative.

As requested, the DOE has determined the costs of all-rail transport to the Cheney Reservoir and Two Road sites. This information is presented in Section 6.5.

3. Comment

Alternatives 1 through 6 don't include pushing the tailings piles into the Colorado River over a period of time. I wondered if there was any way that this alternative could be evaluated (6).

Response

Pushing the tailings into the Colorado River is not a viable action alternative because it would not meet the EPA standards which call for the prevention of tailings dispersal by natural forces and man over a 200- to 1000-year period.

4. Comment

We agree with the decision to move the uranium mill tailings pile from the Grand Junction site. The present location in a meander path on a low alluvial terrace of the Colorado River (p. E1-1 and F-6) places the pile in jeopardy. Ultimately, high discharges of the river would remove all or part of the pile. Removal of the tailings pile will also alleviate the problem of material washing or leaching into the river, potentially impacting fish and wildlife resources. Also, removal of the tailings pile and restoration of the riparian zone would complement proposals by Mesa County and the city of Grand Junction to acquire a greenbelt along the Colorado River floodplain (25).

Response

The DOE concurs with the comment.

5. Comment

Pages 48 and 49. The rationale used to eliminate East Salt Creek and the 6 & 50 sites is very brief and should be expanded (25).

Response

The requested detailed rationale is provided in Appendix C, Alternatives Eliminated from Detailed Study, of the DEIS.

6.4 DESIGN ISSUES

A wide variety of design and design-related issues were raised by commentors. Most comments focused on the cover design and on construction details.

1. Comment

Alternative materials and depths of cover were not considered. Even though the calculations for depth of cover may have an error factor of three, such errors appear to be excluded from any calculations of cover depth. Assurances are made, but inadequate proof is provided, that the assumed five-foot clay will meet the EPA 1000-year standard. The cover should be thicker to provide additional insurance of radon control (22).

Response

The UMTRA Project radon barrier design philosophy is based on the guidance given by the EPA in the background information on their remedial action standards (EPA, 1983a,b). In these it is required that reasonable assurance be provided that the long-term annual average radon release rate be less than 20 pCi/m^2s from the surface of the stabilized pile. This standard is a design standard, not a performance standard, and is to be met through the use of the best available technology and information at the time of the stabilization design. In designing to the EPA flux limit, it is necessary to use pile-averaged values for parameters such as radon diffusion coefficients and the emanating fraction of radon. Likewise, time-averaged values of other parameters, such as tailings and cover moisture contents, are appropriate.

It is recognized that under real conditions there will be areas on a stabilized pile which exceed the radon flux limit, but also areas below the limit; there will be times when environmental conditions result in pile average fluxes that exceed the limit, but other times when different environmental conditions result in fluxes far below the standard. It is the intent of the radon barrier design to acknowledge these variations and to provide a cover that will limit the average release rates to less then 20 pCi/m^2s. It should be understood that worst case or overly conservative assumptions and parameter values are not to be used.

This design approach limits the error in the cover thickness to less than 0.5 foot, which is certainly less than a factor of three as mentioned in the comment. All cover thickness estimates are then rounded up to the nearest half-foot thus compensating for any error.

Detailed cover thickness calculations, which are not warranted in the EIS, are provided in the draft Remedial Action Plan (DOE, 1986a).

2. Comment

Throughout the DEIS it is mentioned that the five-foot cover could be reduced to three feet by first depositing the most highly radioactive material from the mill site on the bottom of the repository, with less radioactive material over it assisting in the retardation of radon. Not only is this difficult to ensure on a consistent basis given quality control of contractor work (which is not addressed), it also is not conclusively proven that it would adequately reduce radon to meet the 1000-year timeframe (22).

Response

It is felt that the 920,000 cy of off-pile contaminated material represents a significant volume which can readily be excavated and transported to the disposal site after the tailings pile has been removed. Reduced cover thickness over a 62-acre disposal site represents a significant cost savings and every reasonable effort to save tax dollars while assuring the EPA standard is met must be considered.

The EPA standard states that there must be reasonable assurance that the flux standard of 20 pCi/m^2s is met. Reasonable assurance means that the best available technology be employed in the radon barrier design. The RAECOM computer code represents the best available technology for modeling the diffusion of radon from a tailings disposal area. By using the RAECOM computer code, it was determined that placing lesser contaminated material on top of the tailings will limit the amount of borrow material required to comply with the EPA standard.

Given that these lesser contaminated materials are currently separate from the tailings, the DOE is convinced that it will not be difficult to segregate this material for placement on the tailings at the disposal site.

3. Comment

Site characterization may not be adequate due to the depth of drilling. Additionally, the Two Road site is not as well characterized as the Cheney Reservoir site (22).

Response

The DOE disagrees. In the DEIS, Section E.2, "Geological and Seismic Information," provides data regarding the bedrock geology of the Grand Junction processing site, the Cheney Reservoir site, and the Two Road site. Each of these sites is underlain by the Mancos Shale. As part of this EIS, the processing site was cored as deep as 150 feet, which verified the presence of competent Mancos Shale, and the underlying Dakota Sandstone. The Cheney Reservoir and Two Road sites were reported in the literature as having 300 to 1400 feet of Mancos Shale underlying the described alluvial sediment. Borings at each site were advanced well into the Mancos Shale (i.e., through the weathered zones into more competent shale) to verify the presence of this shale bedrock. As a result of these efforts, geotechnical characterization is considered satisfactory for this EIS.

In addition, Section E.1, "Soils Information," describes the locations and number of borings and test pits completed at each site. It should be noted that the Two Road site was characterized by 17 borings and six test pits, while the Cheney Reservoir site included eight borings and four tests pits. In addition, 24 borings were completed in 1982 near the Two Road site in support of the Bureau of Reclamation's proposed Glenwood-Dotsero Project. Therefore, it is felt that the number of borings and test pits, the spacing and location of these borings and test pits, and the data gathered from each of these investigations adequately reflects the subsurface geotechnical considerations at each site.

4. Comment

The background radiation tests are meager, and it's unclear if the proposed tests were done at the Cheney Reservoir site. It will be difficult to determine if EPA standards are being met if the background radiation information is not detailed (22).

Response

The proposed tests have been completed. The radiological survey was conducted at the Cheney Reservoir site on April 16, 1985. Integrated Reuter Stokes RSS-111 pressurized ionization chamber measurements were made at four ground-water well or borehole locations. A sodium iodide scintillometer was calibrated against the RSS-111 at each location on the site. The field-calibrated scintillometer was then used to traverse each perimeter line connecting the four RSS-111 measurement locations. Measurement results are provided below. The RSS-111 mean and standard deviation for gamma exposure rate on the Cheney Reservoir site was 13.8 ± 0.4 microR/hr. The scintillometer traverse measurements indicated no anomalies beyond the range of 12,000 to 15,500 cpm. Surface soil samples were collected at the four RSS-111 measurement locations and Ra-226 concentration results are presented. The mean and standard deviation for soil Ra-226 concentration was 1.7 ± 0.7 pCi/g.

Five Track-Etch detectors were deployed at the Cheney Reservoir site from September 20 through December 20, 1985, to measure ambient Rn-222 concentrations. Results are presented. The mean and standard deviation of the five measurements was 0.47 ± 0.06 pCi/l.

Cheney Reservoir site gamma exposure rate and soil Ra-226 concentrations

Location number	RSS-111 min-microR	RSS-111 microR/hr	Scintillometer cpm analog	Soil Ra-226 pCi/g
615	4:26	13.5	13,000	2.1
616	4:26	13.5	12,500	1.0
701	4:23	13.7	14,000	2.6
702	4:11	14.3	15,000	1.3
		$\overline{X}$ = 13.8 ± 0.4		$\overline{X}$ = 1.7 ± 0.7

Results of Rn-222 monitoring at Cheney Reservoir

Location	Rn-222 concentration (pCi/l)	Standard deviation (percent)
Well 701	0.39	15.9
Well 701	0.45	14.7
Well 701	0.45	14.7
Well 702	0.54	13.4
Well 702	0.51	13.8
	$\bar{X} = 0.47 \pm 0.06$	

5. Comment

More detailed information on the ultimate radiation levels, reclamation condition, and potential uses of the mill site must be included (20, 22).

Response

With relocation of the tailings to a disposal site, the mill site will be cleaned up to the EPA standards (see Appendix A, EPA Standards, of the DEIS). All site areas will be backfilled with clean borrow soil. Gamma exposure rates, radon concentrations, and air-particulate concentrations will not be discernable above ambient background levels.

Additional site reclamation and the ultimate disposition of the site will be the prerogative of the owner.

6. Comment

Alternative construction and reclamation programs must be considered, in order to reduce air-quality impacts and impacts on the Colorado River. Please give serious consideration to staging or phasing of the project, as well as staged-cell reclamation (22).

Response

These issues will be given consideration during the final design and bid phases of the project. The impacts reflected in this EIS are conservative and were determined for comparative purposes. Based upon the final design and construction approach, the DOE and its contractors will comply with requirements to minimize all such impacts through Federal, state, and local permits.

7. Comment

Although logic assumes that Cheney Reservoir would be less expensive due to a lesser haul distance, this is not completely substantiated in the

DEIS. The energy, fuel, and water consumption amounts as cited in the DEIS (pages B-92 through B-94) for the alternatives are not significantly different (22).

Response

The commentor is correct. Fuel consumption is greater for Two Road alternatives because of greater haul distances. Table B.5.11 is in error; fuel consumption for the Cheney Reservoir truck alternative, front-end loader now should be 193,000 rather than 407,500 (total should be 4,733,300 instead of 4,947,800). Thus, the differences in fuel consumption of the truck alternatives are principally due to haul distance (3,691,600 vs. 3,976,500 for 10-cy truck with 8-cy pup) and the need for additional erosion protection from an off-site borrow area at Two Road (0 vs. 124,800 for 10-cy truck). See the Errata Sheet, Section 6.25.

8. Comment

Why is there similar anticipated employment for the repository alternatives? One would think that employment would be greater at Two Road because of greater haul distances (22).

Response

The employment projections would not increase due to the longer haul distance unless a greater number of truck drivers were required. The 15 miles distance difference between the Two Road and Cheney Reservoir sites is not great enough to require additional truck drivers.

9. Comment

Should the FEIS retain Cheney Reservoir as the preferred alternative, we request that more analysis be included on engineering and mitigation measures to ensure long-term protection, ie. up to 1000 years (22).

Response

The concepts and supporting information provided in this EIS are intended only to demonstrate the feasibility that EPA standards will be met. The Remedial Action Plan (the document where compliance is demonstrated) and the final design and construction specifications will contain the requested detailed analysis and information on the selected alternative. These documents are subject to the review and approval by the NRC and the State of Colorado.

10. Comment

How far from old 6 & 50 highway will the Two Road site be located (10)?

Response

The proposed disposal area for the Two Road option is approximately 4.5 miles from the 6 & 50 highway.

11. Comment

In your concern for the isolation and stabilization of the tailings, you have neglected to give full consideration to the final aesthetics of your proposals. Since both the parent and relocation sites will be with us for centuries, the visual impact of the end result must be completely addressed and optimized. Unfortunately, your proposals are ugly and unimaginative--efficient but unaesthetic. When humans view these sites (and who can foresee how populations and their viewing angles will change over the decades) they must not be confronted with the tomb-like monumental structures you propose - foreboding and depressing monstrosities guaranteed to shrink the soul. This would be a tragic and shortsighted result for such an enormous undertaking.

Fortunately, aesthetic options for final configurations are feasible and would be compatible with environmental and engineering requirements. Aesthetic strategies could include:

- Sculptural contouring for visual interest.
- Use of plant materials as texture and color.
- Creating visual focal points to reduce the overall impact (21).

Response

Contrary to the statements made in the comment, aesthetics were a consideration in the design of the remedial action alternatives. (Sections B.2.5, B.3.6, and B.4.6 in the DEIS contain discussions relative to these and other design considerations.) Every effort was made to blend the conceptualized embankments into the existing topography for the Two Road and Cheney Reservoir sites, as shown in Figures B.3.3 and B.4.3 (actual scale), the piles will slope with the present topography. The heights of the embankments have been minimized to further reduce visual impacts. More aesthetically pleasing designs may have been developed; however, a primary objective of the UMTRA Project is to stabilize the tailings in such a way as to meet the EPA standards at a minimal cost to the government and therefore, the taxpayers.

12. Comment

The 60+ mile per hour winds that we have experienced recently have the capacity to move up to two tons of soil per hour from the Cheney Reservoir pile, because it can't be stabilized with enough moisture. My concern is the long-term aspect of the tailings blowing onto my property and gradually generating a rebirth of radon gas, which at some point could then, through the natural vacuum of a home, be pulled into the home. We in the western end of the valley (Two Road) are about 98 percent agriculture and we certainly don't need westerly winds blowing radioactive dust onto our fields and livestock. That's a big concern, because we get a lot of wind storms out of the west (1, 4, 11).

Response

The tailings and contaminated material would be covered with a compacted earthen radon barrier; this layer would be topped with a layer of erosion-resistant rock (thicknesses will vary from one to two feet, depending on alternative). The rock has been designed to withstand the erosional forces resulting from the most extreme thunderstorm meteorologically possible in the area; this also would provide ample protection from the erosional forces of wind. During construction of the pile, measures such as the use of tarps and wetting of materials, will be taken to prevent the spread of tailings by wind or water. Therefore, contamination of crops or homes either during remedial action or after closure is very unlikely.

13. Comment

We believe the Two Road site is superior from the standpoint of environmental and geotechnical considerations, and possibly from the standpoint of transportation route impacts. The Cheney Reservoir site is not an unacceptable site strictly on the basis of environmental and geotechnical standards; however, Two Road is a better site. In the state's preliminary report on potential repository sites, Two Road was rated the highest of all the sites based on geotechnical considerations. In the DEIS (see appendices, page C-24), the other similar sites in the vicinity of Two Road clearly rate higher and the Cheney Reservoir site had the lowest site suitability score (20, 22).

Response

Although the scores indicate that for certain factors the Two Road and vicinity sites may be "better" than the Cheney Reservoir site, they do not reflect site characterization information (i.e., scoring was based on regional literature rather than site-specific information) nor the fact that these sites could meet the EPA standards with relatively simple designs. In other words, although each site has its favorable characteristics, both could be used in an equally acceptable manner.

14. Comment

The existing tailings pile now acts as the easterly portion of a flood control dike along the Colorado River. Reconstruction of the dike after removal of the tailings pile has not been addressed in the DEIS (24).

Response

The 400,000 cy of restoration material will be used, in part, to reconstruct the dike, or in an alternate manner, to assure continuing river flood control.

15. Comment

The City is studying the feasibility of the redevelopment of the 5th Street (Highway 40) and Colorado River area. To reduce the costs of reclamation of the Grand Junction site after removal of the tailings, we recommend creating a lake in a portion of the site. This would reduce the total amount of fill that would have to be imported, and the lake would provide a recreational amenity for future park users. The remainder of the site would be revegetated as described in the DEIS (24). The

Department of the Interior requested that at least 25 acres of riparian vegetation be re-established as well as ponds (25).

Response

As currently planned, the state probably will purchase the mill site. Agreement will be reached between the DOE and the state regarding the extent and nature of mill site reclamation during final design. The use of the decontaminated site will be determined by the ultimate owner.

16. Comment

Stabilization on site would be difficult to meet EPA standards for radon emission and ground-water protection (20).

Response

The DOE disagrees. Based on the modeling information contained in Sections B.2.4 and B.2.7, and Appendix F, Hydrology Report, of the DEIS, it is clear that the EPA standards for radon emissions and ground-water protection can be met.

17. Comment

The radon protection cover and the rock armor overlying it are both dependent on a stable tailings pile for their structural integrity. Cracks in either can foster erosion and escape of radon. The DEIS mentions the compaction of the relocated tailings and we presume that standard engineering practices will be followed. However, the design considerations for the Cheney Reservoir alternative do not mention any means by which the transported tailings will be tested for compaction or for similar parameters related to the pile's function as a foundation. Also, the discussion of Tailings Pile Construction (p. B-38) does not specify any means of confirming that the expected compaction and absence of extensive layers of slimes are actually the case. Assurance of a stable foundation is critical to each alternative (25).

Response

The commentor is correct; assurance that the in-place embankment materials will function as a stable foundation for the overlying portion of the embankment is acknowledged as a critical factor in the design. Statements made in the EIS are to recognize that concern and to provide summary information on design guidelines which will be discussed in more detail in the Remedial Action Plan, and further outlined in the final design and construction specifications. The Remedial Action Plan will provide detailed foundation analyses and a discussion of applicable parameters such as permeability and compaction. The method of verifying the compaction effort in the field will be outlined in the construction specifications, as will the requirement that extensive layers of slimes not occur in the final embankment. In addition, observations made during excavation at the Salt Lake City site indicated that normal excavation procedures provided sufficient mixing to prevent the relocation and placement of extensive layers of slimes.

18. <u>Comment</u>

Pages 23 and 24. The magnitude of each alternative of the project should be better defined. Examples: provide the size of the waste-water retention ponds; type of fencing and how much (25, 26).

<u>Response</u>

The purpose of the concepts in the DEIS is to compare potential environmental impacts resulting from the various alternatives evaluated. It is not necessary to provide detailed descriptions and specifications of construction items to accomplish this purpose. During final design, the waste-water retention ponds, construction fences, permanent fences, and other features will be designed.

19. <u>Comment</u>

Page 61, 4.2.4. The number of cubic yards of borrow material should be included here (25).

<u>Response</u>

Agreed. Section 4.2.4 has been revised.

20. <u>Comment</u>

Define low permeability. Give the materials of which the capillary barrier would be constructed (25).

<u>Response</u>

These design details will be included in design documents. Generally, low-permeability would indicate materials which have a saturated hydraulic conductivity of less than 10^{-6} cm/sec. A capillary barrier would be constructed of coarse sand or gravel.

21. <u>Comment</u>

Figures B.3.1 and B.4.1 in the Appendix of the Draft EIS should appear in the Final EIS along with appearing in the Final EIS Appendix (25).

<u>Response</u>

The DOE believes that the discussion in the text and the figures in the appendix of the DEIS are sufficient to enable the reader to determine where the disposal sites are located. No additional revisions are needed.

22. <u>Comment</u>

Page 19 indicates that a significant volume of contaminated alluvium exists beneath the tailings (0.38 million cubic yards is estimated). Under tight restrictions, washing/separating of contaminated gravel and gravel/cobble facies and reuse of cleaned rock at the processing site may be economically attractive. Contaminated water from this washing operation could be treated in the waste-water treatment unit (26).

Response

The suggestion for decontamination and reuse of gravels is economically attractive and will be evaluated during preparation of the final design and specifications.

23. Comment

Water quality will very likely be affected by excavation of the tailings from the Grand Junction site especially when the tailings and contaminated soils are below the water table. The DOE should consider alternative measures for retarding surface flows and ground-water intrusion onto the Grand Junction site. One such proposal would involve the excavation of trenches along the south and at least some portions of the east and west flanks of the tailings pile, backfilling of these trenches with low-permeability clay materials, and constructing earthen berms above the existing ground surface. A system of this type, if supplemented with an appropriate downgradient well withdrawal system, may provide an adequate means of controlling induced flow (recharge) from the Colorado River, and would appear to be considerably less expensive than the proposed sheet-piling system. A test pit program to determine current infiltration rates of surface water and ground water onto the site from the river and from the east and west directions should be performed, and a detailed analysis of the feasibility of this design alternative developed, including necessary clay material properties and availability, volumes and locations of trenches required, and comparative cost estimates (26).

Response

The DOE believes that sheet piling, or some other form of braced excavation, will be required to inhibit ground-water flow as well as Colorado River flow onto the site. It has not been determined as of yet whether a trench/berm/well withdrawal system as described in the comment would provide the required protection and would be less expensive than the sheet pile system. Therefore, this issue will be evaluated during the final design process.

24. Comment

The State of Colorado raised several issues regarding the long-term integrity of the proposed cover. They were concerned with plant and animal intrusion, freeze-thaw, and drying of the cover. The accumulation of intergrain soil will lead to the establishment of plant communities, and the rock cover will not prevent animal intrusion or the drying of the upper layer of the radon cover (26).

Response

The conceptualized cover systems were formulated based upon approaches and methods detailed in the UMTRA Project Technical Approach Document (TAD) (DOE, 1986b); this document was reviewed and accepted by the NRC and EPA. Further, the cover systems were formulated to comply with the requirements of the NRC's Standard Review Plan (NRC, 1986). The methods and approaches incorporated into these two documents are formulated to lead to designs that meet the EPA standards applicable to the UMTRA Project, and thus would provide pile stability for the required period against the action of natural forces, and inadvertent human and animal disturbance.

The DOE maintains that the conceptualized cover design would discourage burrowing animals and plant intrusion. In addition, any intrusion by burrowing animals or plants observed during periodic surveillance inspections would be evaluated and corrected as necessary as part of maintenance. The actions of dessication and freeze-thaw are discussed in the above referenced documents where it is shown that neither action will affect pile integrity. Dessication may occur during prolonged dry periods, however, the changes in moisture content will not cause cracking of the soils comprising the cover. The thickness of the radon barrier is sufficient to maintain EPA standards even for the driest anticipated moisture conditions. The soils used to construct the radon barrier would be chosen and placed so that cracking under anticipated dry conditions could not occur to a degree capable of affecting pile integrity.

The erosion protection rock is chosen so that it is not susceptible to freeze-thaw degradation during the design life of the remediated pile. Procedures given in the TAD are used to achieve this end.

Freeze-thaw and potentially associated soil heave are phenomena which generally affect only saturated or very moist soil strata in close proximity to the ground-water table. These conditions, in particular the proximity to the ground-water table, would not prevail in the radon barrier. Freeze-thaw not associated with soil heave does not affect the radon barrier performance. In addition, freeze-thaw has little effect on clay soils, of which the radon barrier would be constructed. Even in the unlikely event that soil heave does occur in the upper part of the radon barrier, the reduced soil density with increased radon barrier layer thickness will not result in a significant change of radon emanation or infiltration.

25. <u>Comment</u>

Two feet of rock on top of five feet of compacted soil cover does not appear to offer sufficient protection of the radon barrier and the tailings (i.e., provide for long-term stability) (26).

<u>Response</u>

The thickness of the erosion protection layer is a function of the mean diameter of the rock required to resist the erosive forces of the design (i.e., maximum) flow (PMP) and is independent of the material to be protected (radon cover and tailings).

Section B.3.7 of the DEIS, for example, describes the analyses performed to determine the rock sizes and rock layer thickness required to protect the radon barrier from erosion. The DOE has determined that the rock armor is more than sufficient for long-term protection.

26. Comment

Should the permanent drainage ditch around the stabilized Cheney Reservoir pile be armored with riprap to protect against erosion effects (26)?

Response

As shown on Table B.6.5 of the DEIS, the diversion ditch would be armored with 18 inches of durable rock.

27. Comment

Page B-10, paragraph 3. The mixing described in sentences 2 and 3 should be designed into the RAP/final design and not presumed a priori to be unnecessary (26).

Response

As suggested, the mixing described will in fact be required and controlled by final design and specification requirements for compaction. The wet slime deposits within the Grand Junction tailings will need to be mixed with dry sand tailings in order to lower their moisture content to that specified for compaction density (below optimum moisture content). In doing so, their material properties will become that of a sand-slime mixture rather than slime tailings. Should this mixing not occur during routine excavation, transport, deposit, and compaction in a final embankment (as occurred at Salt Lake City; see response to comment number 17), specified compaction requirements would not be met and the contractor would need to apply supplemental mixing methods. Since actual tailings material properties will be used to develop final design specifications, and those specifications will include appropriate field test requirements, a stable tailings pile is ensured.

Section B.3.7, Settlement and Cover Cracking, of the DEIS should be modified to reflect this response. See the Errata Sheet, Section 6.25.

28. Comment

If feasible, every reasonable effort should be made during remedial action to segregate uncontaminated organic materials such as wood demolition debris, and that fraction of concrete slab fragments, chunks, etc. . . . , that are uncontaminated, and dispose of these materials at some location other than within the repository embankment. The volumes of such materials will be significant, and if not reduced, could pose major problems in the tailings compaction effort and possibly lead to increased levels of differential pile settlement (26).

Response

Provisions will be made in the final design and construction specifications to ensure that differential settlement of the pile will not occur. The provisions will include performance specifications (relative to moisture contents, concentration of organics, and the like) as well as design specifications. In addition, the documents will include provisions for disposal of uncontaminated debris and organics and for contaminated organics that exceed the specified limits.

29. Comment

Additional drying of lower lying, more saturated tailings and contaminated soils may be required. Areas may need to be set aside for windrowing of these materials (26).

Response

Agreed. The construction subcontractor will be responsible for the moisture condition of the tailings and contaminated material in accordance with construction specifications. Placement of the tailings will be subject to inspection by the DOE's independent quality assurance group.

30. Comment

Page B-19, paragraph 6, 2nd sentence - Recommend rephrasing as "uncontaminated materials excavated from each pond would be stockpiled. . ." (26).

Response

Agreed. The referenced section of the DEIS should be modified accordingly. See the Errata Sheet, Section 6.25.

31. Comment

Page B-20, paragraph 2, 3rd sentence - Does not make sense (26).

Response

Review of this statement indicates that the intent of the statement is clear. The equipment, pads, and other materials designated as the staging areas would be dismantled. Contaminated items would either be decontaminated and salvaged or buried (under proper license and/or EPA standards). The most cost-effective alternative would be chosen. The contaminated material would be buried in the embankment unless the five percent limit on organics is surpassed.

32. Comment

Page B-35, "'Cheney Reservoir Site' 1st bullet . . . (approximately five miles)," (26).

Response

Although an alternate route ultimately may be selected, for purposes of the EIS it was assumed that the existing ranch road would be upgraded. This road is approximately 3.8 miles long. Section B.3.2 of the DEIS should be revised to read " . . . (approximately four miles)". See the Errata Sheet, Section 6.25.

33. Comment

Page B-56, paragraph 5, 2nd sentence - Should be rephrased as: "This would restrict water buildup over the earth cover and reduce the potential for frost heave (ice lens formation . . .) . . ." (26).

Response

A more accurate statement would be: " . . . reduce freeze/thaw, the potential for frost heave . . ." Section B.3.7 of the DEIS should be revised accordingly. See the Errata Sheet, Section 6.25.

34. Comment

Design features and in-situ soils would tend to reduce the potential for contaminant migration from the tailings. Use of the words "minimize" and "minimal" throughout Section B.3.8 should be reconsidered and any appropriate revisions made (26).

Response

At present these qualifying words are appropriate because methods to predict contaminant migration from the site have not been agreed to by DOE and the state of Colorado. Following the development of the appropriate methodology "minimized" will be quantified. The quantification will be reported in design documents.

35. Comment

Page 105, last paragraph, 1st sentence - Recommend rephrasing as: "site the tailings would be placed above this water table" (26).

Response

The word "well" has been removed as requested.

36. Comment

Page F-170, paragraph 1, a system for controlling induced flow (recharge) from the Colorado River and ground water has already been described to allow for effective excavation of saturated, lower-lying contaminated zones at the tailings site. Therefore, the statements made in this paragraph concerning installation of a slurry wall and the associated increases in cost appear to have been made out of context with other sections of the DEIS (26).

Response

A system to control inflow from the Colorado River may be more rigorous than a system to allow excavation of tailings below the water table. Therefore, mention of various control options is appropriate even though sheetpiling for dewatering of saturated tailings was considered. In addition, no surface-water inflow controls are included in the aquifer restoration cost estimates for the case where sheet piles installed for excavation would be adequate for use in aquifer restoration.

37. Comment

Long-term geomorphic processes, including erosional undercutting (and subsequent bank failure) due to meander encroachment by the Colorado River, possible channel avulsions, and the effects of cumulative flood events have the potential to disrupt the stabilized on site pile in much less than 1000 years. Calculations provided of PMF water levels, scour depths, and maximum flood velocities along the proposed pile edge have only been performed for the river based on its present configuration. Modeling should be done for several alternative channel boundary geometries and associated hazards to fully assess the stability of the site. Designs would have to mitigate the impacts of any such potential future changes in the Colorado River. Examples of additional design features, which may be appropriate are keying of the rock armor wall into competent bedrock (i.e., to a depth below the soft, weathered zone of the Mancos), and extending the compacted radon cover and cap layers into the natural ground behind the armor wall. This would probably increase the cost of this alternative significantly (26).

Response

As discussed in Appendices B, E, and F of the DEIS, the geomorphic processes capable of affecting the SOS design were investigated and analyzed in great detail. Rather than analyze a potentially endless number of alternative channel boundary configurations and geomorphically altered conditions, a number of conservative assumptions were made in order to estimate a very conservative design scenario.

The reviewer is referred to Figures B.2.7 and B.2.8 of the DEIS in reviewing the remainder of the response to this comment.

Initially it was assumed that the steep Mancos bluffs which form the south bank of the Colorado River could be considered a "permanent" feature. Therefore the left overbank geometry of all cross sections was not altered from the existing geometry. (Cross section locations are shown on Figure B.2.7.) Upstream and downstream of the site the existing channel constitutes less than 10 percent of the PMF floodplain and the normal flow depth is less than 25 percent of the PMF flow depth; therefore, the effects of the existing river bed geometry, and any revisions to that geometry (such as deposition or aggradation of the channel bottom) are negligible. The only differences between the actual channel and the portion of the PMF floodplain that is outside of the existing channel that the model would recognize were the Manning's "n" values used for flow over the culturally affected areas. If the Colorado River were to meander toward the city of Grand Junction during a major flood event, it is reasonable to assume that the roughness of the areas now covered with industry, buildings, and streets would be different than for a natural river bed.

The following was critical in determining the erosion protection requirement for the SOS design due to a PMF occurring on the Colorado River:

- As illustrated in Figure B.2.7, the peak velocity during any large flood would occur in the constriction between the reclaimed pile and the Mancos outcrop forming the south bank of the river, regardless of the upstream conditions. The peak velocities estimated in this constriction were used to determine the depth of scour and thus, the depth that the erosion protection would need to extend. If the channel were to change direction and flow either directly toward, or north of, the site (it has been assumed that the existing south bank is permanent), the velocities would be greatly reduced since the channel capacity would be increased by a factor of 20 or more. The mean channel velocity for the constriction was used to determine the size requirement of the erosion protection material. This velocity was not only applied to the "river side" of the pile but to the north and upstream ends as well, although reason would dictate that the velocities at the north side and upstream end of the pile would be much less than the design velocity used in the analysis.

Since the effects of channel meander and other geomorphic processes cannot be accurately quantified or predicted, the analysis used for this design is conservative and predicts the worst scenario that can be predicted, within reason, using the available technology.

If SOS is chosen as the remedial action, the design will be refined and detailed calculations will be performed and submitted.

38. Comment

No mention is made on page B-38 of the treatment and compaction of the sides of the excavation (26).

Response

The treatment and compaction of the sides of the excavation is a design consideration which will be addressed in the Remedial Action Plan, and in the final design and construction specifications. If preliminary analyses indicate a potential for sideslope failure, a more detailed analysis would be undertaken to supplement appropriate design considerations, such as a provision for a maximum slope angle.

39. Comment

Mixing of the tailings sands and slimes on the site, to assure a uniform moisture content, may be difficult where excavating from below the water level. Since this will be late in the project, dry blending material may be in short supply and hauling of saturated tailings for blending at Cheney Reservoir will increase haulage costs (26).

Response

This comment is correct and thus, merits further consideration during the final design. The relocated contaminated material will be placed at a moisture content specified in the construction specifications. It also should be noted that the cost estimates provided in the DEIS contain contingencies for construction problems such as those discussed in the comment.

40. Comment

Grubbed brush will prove difficult to uniformly place at five percent volume, which could lead to excessive settlement. The brush should be disposed of by means other than site burial (26).

Response

This issue will be further considered in the final design. However, as noted in the DEIS, grubbed brush will be disposed in the embankment unless volumes exceed five percent and analyses indicate a potential settlement problem.

41. Comment

The below-grade hopper should be designed such that no interference with ground water will result (26).

Response

If either rail option is chosen, the below grade hopper will be designed to the same specifications (environmental requirements and licenses) as on-site facilities.

42. Comment

Page B-110. Basal layer standard Proctor compaction to 95 percent is inconsistent with page B-57, paragraph 5 (26).

Response

As stated on page B-57, one of the primary design criteria for the basal layer is that it must possess an order of magnitude higher permeability than the cover in order to prevent the "bathtub" effect. The final design and specifications will specify the compaction or permeability to be achieved in the basal layer such that the permeability will remain higher than the cover. These criteria will be a result of laboratory testing of the material to be used and the results will be applied to the construction specifications so the contractor can be monitored during construction.

43. Comment

Utilizing a computer program, which assumes a circular failure surface, does not address movement associated with a composite failure surface or with an infinite slope, planar failure. Both of these failures could occur with the failure plane represented by the low-permeability clay barrier and the high-phi angle tailings sand. A steep angle of failure as opposed to the flat angle shown in Figures B.6.8 and B.6.9 is more likely as the failure surface crosses the armoring (26).

Response

The analyses performed indicate the relative stability of slopes associated with each alternative. A more complete slope stability analysis will be completed for final design. These later analyses will include infinite slopes through both the clay cover and tailings, as well as deeper seated failures if deemed necessary to determine the most critical failure methods for each stage of construction, and for both static and seismic scenarios.

44. Comment

Sections B.2.6 and B.3.7, Long-Term Stability, state that "severe rainfall events have the potential to develop rills and gullies on the steeper (20 percent) sideslopes of the stabilized tailings pile and erode some or all of the radon cover in small undefinable areas." The basis for this statement should be provided. If physical model studies have shown that a 20-percent slope is critical, the model study report should be referenced (28).

Response

The referenced statement is not meant to infer that 20-percent slopes are critical but rather is a statement of judgement, reflecting past experience gained on the UMTRA Project. Twenty percent slopes are singled out as having the potential to form rills and gullies only because they are the steeper of the pile design slopes (20 percent for sideslopes and three to four percent for topslopes).

45. Comment

Section E.1.4.2.2, Flood potential, states that the Corps of Engineers (COE) has calculated flood flows for the Grand Junction area. In Appendix F (page F-15) the DOE provides the peak discharges claculated by the COE for the 100-year and the 500-year floods, but not the COE's PMF peak discharge. DOE calculated a PMF discharge of 889,000 cfs for the Colorado River at the site. Discuss how this compares with the COE's PMF (28).

Response

The COE did not estimate a PMF for the Colorado River. The flows discussed in the document were obtained from the COE, 1976.

6.5 COSTS

Several comments focused on the inadequacy of the cost estimates. They were concerned with haul distance costs versus costs from traffic congestion, construction costs, long-term site care costs, and access costs.

1. Comment

Although logic assumes that Cheney Reservoir would be less expensive due to a lesser haul distance, this is not completely substantiated in the DEIS (22).

Response

All other things being equal (e.g., quantities for disposal site covers), the other items affecting or controlling costs are the off-highway road improvements and/or construction and maintenance, and the hauling distance. The cost of hauling can also vary depending on the road conditions, traffic, weather, and especially the favorable or unfavorable grades encountered.

The hauling distance to the Two Road site is greater than to the Cheney Reservoir site by more than 80 percent. Hauling-only costs can be approximated; costs vary from 15 cents to 25 cents per ton-mile. Using 20 cents per ton-mile yields:

Distance to Two Road	33 miles
Distance to Cheney Reservoir	18
Difference	15 miles

Thus, additional costs to haul due to longer haul distances:
3,083,200 cy @ 1.35 ton/cy = 4,162,320 tons

Increased Cost = 4,162,320 x 15 miles x $0.20/ton-miles = $12,486,960

This increased cost could be modified to some extent by the time it takes to drive through comparatively congested areas, but the increased distance to the Two Road site cannot be swept away by equating it to delay in hauling time due to congestion. Observations at different times during the day indicated that traffic delays and congestion are similar for both routes, although possibly greater for the route to the Two Road site.

2. Comment

Specific transport considerations do not appear to be costed (e.g., time in transit expense as well as total miles travelled). Because of congestion of D Rd, 32 Rd., and Highway 50, transport time to Cheney may be equivalent or greater in cost than to Two Road (22).

Response

As stated in response 1, the hauling costs are affected by traffic, weather, road conditions, and the like, and are considered in the average time it takes a haul truck to load, make its way to the disposal site, discharge its load, and return to its place of origin.

A truck haul to either site must originate just south of the central part of the city and make its way to U.S. 50. The time it takes a truck to navigate through Orchard Mesa on U.S. 50 is small compared to the total cycle time. Average speed to the Cheney Reservoir site may be somewhat less than Two Road, but the difference is insignificant in terms of total cost.

3. Comment

Many of the construction costs associated are not widely variable, see Table B.5.15 in the DEIS Appendix (22).

Response

Agreed. Where costs are identical or close, it means the items are identical or similar, recognizing that costs can vary slightly depending on where the item originates, the final design, and other factors.

Erosion protection and site restoration are slightly different due to haul distances and manner of performance through choice of equipment. Scrapers (usually accompanied by lower costs) may be preferable to loaders and trucks.

Liner, cover, and fencing costs are identical whereas the remaining items vary substantially, as expected.

4. Comment

Where construction costs do vary in Table B.5.15 there is no explanation. For example, why are repository site preparation costs and supervisory services higher for truck/rail alternatives (22)?

Response

Site preparation costs are, as a rule, those costs incurred by the contractor early in the job, such as mobilization of personnel, plant and equipment, preparing the areas, and the like. Early payment for these items of work is necessary to keep the contractor's investment to a minimum. Hence, site preparation for truck/rail is considerably higher because at least part of the cost of required roads, railroads, and plants are included in the up-front cost of work.

Site preparation also includes an amount for all-risk insurance, bond premiums, and other items whose costs are determined as a percentage of the total cost, which adds to the higher cost of an overall more expensive project.

Supervisory costs are a function of the total cost; when the volume of work (activities requiring monitoring, control, quality assurance, accounting, and auditing) increases, the supervisory costs also increase.

5. Comment

The transfer of tailings from rail to truck has been cited as double-handling with greater attendant costs, but is not well documented in the DEIS (22).

Response

The cost to transfer tailings is included in the total cost of "Tailings earthwork and/or relocation" in Table B.5.15 of the DEIS. This part of this cost is not identified because the DEIS, as a rule, does not provide such detail.

When tailings are loaded into trucks for hauling directly to the disposal site, they remain there until discharged at the site. With a rail/truck operation, the tailings are loaded and hauled to the train car loader, a double-handle since they were once loaded into trucks. After the rail haul to the unloading spur, the tailings are dumped and reloaded into trucks for a final haul to a deposition point. This is the second "double-handling."

Costs of double-handling result from the need to purchase, install, operate, maintain, and finally remove the plant and equipment required to perform the designated task.

For any rail option, these costs would most likely be identical in terms of unit costs.

6. Comment

Rail costs per mile or load are not documented (22).

Response

Recent discussions with a Denver and Rio Grande Railroad representative produced the following rail freight charges:

Rate to Mack	$2.94 per ton
Rate to Whitewater	$2.81 per ton.

7. Comment

Cost information is a key element in this DEIS because it plays a significant role in selection of the repository site. The DEIS has numerous deficiencies regarding costs:

- o Special traffic considerations were not costed (e.g., transit time expense).
- o Transfer costs (i.e., rail to truck) are not documented.
- o Data on rail costs were not included.

- o Costs for decontamination of properties adjacent to haul routes were not considered.
- o Lack of information on liability issues (20).

Response

Transit time costs are not usually treated as an independent cost entity. Estimators develop a total truck haul cycle consisting of:

Load time in minutes
Haul time in minutes
Dump time in minutes
Return time in minutes
Stop & wait time in minutes
Total time in minutes

Total time (in minutes) is then divided into a 50-minute or 45-minute hour to find the number of trips/hour; this is then multiplied by the truck capacity to find the total cubic yards of materials hauled every hour by a truck. Total number of trucks required, and total truck hours can be derived and multiplied by the cost to operate a truck.

Transfer costs are as follows:

- o Cost to install rail car loading/unloading facility - $7,130,000
- o Cost to operate loading facility - $2,470,000
- o Cost to operate unloading facility - $2,500,000

The rail costs are as follows:

Rail haul to Whitewater or Mack	($000) Cheney Reservoir	($000) Two Road
Install rail facilities	$ 7300	$ 7300
Charge loading facilities	5600	5600
Operate loading facilities	2500	2500
Rail haul	14,250	13,950
Operate unloading facilities	2500	2500
Maintain track	480	480
Subtotal	$32,630	$32,330

Increased cost to continue rail from Mack to Two Road disposal site

Rail haul

Construct track	$17,000
Added frieght cost	9770
Track maintenance	420
Contingency	4620
Total	$31,810

Comparative truck haul from
<u>Mack to Two Road disposal site</u>

Upgrade Rt. 6 & 50	$4000
Maintain Rt. 6 & 50	1000
Upgrade/maintain Two Road	1080
Truck haul cost	11,560
Contingency	3090
Total	20,730
Increase (rail over truck)	$11,080
Supervisory and field services and construction management (additional incremental cost, not total cost)	3320
Net Increase - Cost for rail haul all the way to Two Road site vs. rail to Mack and truck from Mack to Two Road site	$14,400

Costs to decontaminate adjacent properties, either along a haul route or at a disposal site, are expected to be negligible. Regardless of the haul method chosen, each load will be sealed by use of covers, seals, and the like. As an example, at the UMTRA Project site in Salt Lake City, to date approximately 1.4 million cy of tailings have been transported by rail 80 miles to a site west of the city and no accidents have occurred. Only in the event of accident or unusual occurrence would decontamination of property adjacent to haul routes become necessary.

Regarding liability, the provisions of UMTRCA, Public Law 95-604 vest liability in the Federal Government.

8. <u>Comment</u>

Several commentors raised a variety of cost issues. Several requested detailed cost breakdowns (9, 18, 24). Some commentors also requested cost estimates for road upgrade and maintenance (20, 22, 26).

<u>Response</u>

It should be noted that costs summarized in the EIS were developed from detailed construction industry parameters based upon <u>conceptual</u> design assumptions. Since the parameters applied were constant for all options, the costs quoted reflect valid program level cost comparison of the options. This is true even though some of the design concepts may change during final design development. The EIS costs are programmatic level costs which include add-ons for risk and contingency in addition to contractor management, overhead, and the like. DOE is hesitant to publish cost details beyond those provided that could compromise the competitive bidding process at a future date.

Costs for upgrading and maintenance of state roads for relocation to the Two Road site are included in response 7 above. Maintenance costs for highways (except for haul roads) are not chargeable to the UMTRA Project.

9. Comment

We had hoped to make an unequivocal recommendation on a repository site vis-a-vis the preferred alternative. This proved difficult given that cost estimates appear to drive the selection of the preferred alternative. Previously, when stabilization on site appeared least expensive, the DOE expressed interest in this alternative. As the greater costs of this option became apparent in terms of attempting to meet EPA standards, repository selection became more of a priority. So this DEIS includes the Cheney Reservoir site as the preferred alternative. DOE and State Health Department personnel have also made repeated public references which indicate a bias toward selection of Cheney Reservoir as a repository due to its supposed less cost. While costs are certainly a major factor to be considered, the DEIS does not do a fair and comprehensive comparison of the costs of the alternatives, and omits factoring in some of the environmental problems associated with the Cheney Reservoir alternative (22).

Response

The DOE disagrees. The basis for the costs for each alternative, as shown by responses in this section as well as in Appendix B, Engineering Designs, of the DEIS, are clearly shown. Although the DOE recognizes that there are costs associated with mitigations and impacts for each environmental component, the environmental differences between alternatives are considered of less cost impact than the comparative construction/transportation options. Recognizing that placing a dollar value upon environmental impact is subjective at best, the DOE has considered and determined that environmental differences between alternatives are not of a cost magnitude that would change the comparative total costs cited in the document.

10. Comment

My reason for opposing the Two Road site is that it is 50 percent more expensive to go to the Two Road site than stabilization on site, which translates to millions of extra tax dollars for people (11).

Response

Agreed.

11. Comment

Provide information on ownership, location, and right of way cost for the access road to the Cheney Reservoir site (20).

Response

The disposal site, located in Section 11, T3S, R2E, Ute Principal Meridian, is administered by the BLM; no costs will be required for transfer of the land to the DOE.

No costs have been included for rights-of-way for any alternative. Although these costs cannot be estimated until the final access is selected, a route from U.S. 50 crossing only public land will be recommended for consideration during final design.

12. Comment

Costs are both real from a financial standpoint and perceived to result in injury to the image of the community. This is a factor especially in the no-action alternative, but also all other alternatives as not all locations will be cleaned up (26).

Response

Economic gains or losses due to a "perception" of a community's image cannot be estimated.

13. Comment

The long-range costs associated with maintenance of the disposal site to mitigate the impacts of plant and animal intrusion (dessication and freeze-thaw) could be substantial under the proposed design, and could represent a significant portion of the total reclamation cost (26).

Response

The DOE disagrees. The cover design recommended, which is essentially the same as those being constructed at the Salt Lake City, Utah, Shiprock, New Mexico, and Lakeview, Oregon, UMTRA Project sites, will minimize plant and animal intrusion for an extremely long period of time. Regardless, surveillance and maintenance costs would be similar for each alternative and relatively minor compared to construction costs. Further, these costs will be borne entirely by the Federal government under a long-term surveillance and maintenance program.

14. Comment

Cross sections of the Cheney Reservoir site (eg. F-181, F-182) indicate that rather extensive zones of gravely/cobbly and sandy material exist within the excavation zone. The surficial layer of alluvial, colluvial, and eolian deposits ranges from about 23 to 42 feet in depth, and is apparently comprised mostly of debris fan/flow deposits. The costs associated with sorting/reworking of these on-site soils to obtain cover materials needs to be compared with the costs of developing and utilizing an alternate borrow site, and cost-vs-performance studies should be presented to evaluate the cost-effectiveness of various proposed cover designs (26).

Response

Additional test pit data collected from the Cheney Reservoir site have confirmed that sufficient erosion protection material and radon barrier material is available from the proposed below-grade excavation on or adjacent to the site.

Although more detailed cost analysis of sorting/reworking on-site soils and rock will be performed during the final design, at this time it is anticipated that use of on-site materials will be less expensive than hauling in material from a commercial or remote source.

The cost estimate and environmental impacts associated with disposal at the Cheney Reservoir site were developed assuming screening and use of on-site cover materials.

6.6 TRANSPORTATION ISSUES

Transportation issues were addressed in detail by a large number of commentors. Of prime concern were the selected transport routes, accidents anticipated and associated cleanup, and road maintenance and repair.

1. Comment

Transportation routes and associated impacts are of primary importance to the Task Force. The transportation mode and cost appear to be the driving force in the DOE selection of the preferred alternative. The DEIS proposes the Cheney Reservoir site by truck transport as the cheapest alternative; the data presented do not substantiate this conclusion. The DEIS has numerous deficiencies regarding transportation including the fact that no alternatives for truck haul routes were presented. Examples include possible closure of the 5th Street bridge and conflicts with school bus routes (20).

Response

For purposes of this EIS, the DOE examined the routes described in the DEIS to realistically estimate upperbound impacts from remedial action. This is not to say that the routes considered are the "best" available to all reviewers or will be used in their entirety during remedial action. In fact, based upon input from reviewers of the DEIS, DOE has concluded that the impacts of hauling the tailings one way along D and 32 Roads to the Cheney Reservoir site would be greater than hauling both ways across the 5th Street Bridge. Under investigation is the possibility that the 5th Street Bridge replacement and tailings relocation could be phased so that the two activities are not concurrent. Studies of these and other alternatives with a variety of specific mitigations to reduce impacts will be performed during the final design.

2. Comment

Accident rate methodology is unclear (20).

Response

The number of nonradiological accidents are calculated based on the number of vehicle miles travelled and the current accident rate for the highway segment in use. For example, if the injury accident rate were given as 2.85 accidents per 1,000,000 vehicle miles in 1985, and it was known that 500,000 miles would be travelled in a 12-month period of time, the projected number of injury accidents would be 1.43. The number of miles used in each calculation is based on the projected number of truck trips (to haul tailings or borrow materials) and when applicable, worker commute and miscellaneous trips. Accident rates (injury and death) are compiled by the Colorado Department of Highways. Section 5.15 discusses the anticipated accidents for each alternative.

3. Comment

No analysis was included to estimate the impacts of tailings transport on tourism and area image (20).

Response

Because validation of calculable tailings transport impact upon tourism and area image has not been possible at any UMTRA Project site currently under construction, DOE does not believe there would be any at Grand Junction. However, in the long term, movement of tailings out of the metropolitan area would certainly enhance the image of the Grand Junction area for future residents, employers, and visitors.

4. Comment

Several individual commentors, the City of Grand Junction, and Friends of the Earth/Sierra Club were concerned with the specific transportation routes analyzed in the DEIS. Several comments suggested alternative routes, maintenance and upgrade needs, and more analyses of the specific segments (2, 9, 18, 22, 24).

Response

As noted in response 1, the routes selected for analysis in the EIS were for purposes of impact analysis. The routes are reasonable but with the input received to date from the commentors, they could be improved.

The DOE appreciates the knowledgeable input and recommendations regarding truck transportation routes into and out of the city. This information will be used during final design to evaluate alternate truck transport routes to ensure that the least disruptive route will be selected along with appropriate traffic controls, turning lanes, and the like.

5. Comment

Transportation impacts are probably greater for Cheney Reservoir than for Two Road. While the cited accident rate is less for the Cheney Reservoir site using trucks (see DEIS text, pages 200-201), the statistics may be misleading, because the accident rate is heavily based on miles travelled. The Two Road alternative would require a greater number of miles travelled; however, local observation and experience would indicate that safety and congestion issues are much higher for the Cheney Reservoir haul route in considering the entire route impacts, specifically the much higher traffic volume and congestion on D Rd, 32 Rd., and turning across traffic twice on U.S. 50. Utilizing the accident rate for "all roads" or "county roads" to estimate accidents for the Two Road vicinity is an overestimate, because of the isolation and virtual lack of traffic on Two Road (22).

Response

The commentor has a good point. However, it should be noted that countywide accident rates were used where segment data were unavailable for both the Cheney Reservoir and Two Road sites. Given that the vehicle-miles travelled for "remaining roads" relative to "all roads" is greater for the Two Road site (Table 5.16), the reviewer is correct that accident rates would tend to be overestimated.

6. Comment

I'm very concerned about transportation through the town of Whitewater. Currently, we have a two-lane road that goes through the town of Whitewater, and even though the speed there is reduced to 45 miles an hour, very few people observe that restriction. There is a major intersection where school busses and many residents enter the highway. There is also a store across the street that has exits and entrances in that same area. So I'm very concerned about if there is an accident, what happens to the mill tailings? Who is going to clean it up (8)?

Response

DOE and its contractors will respond immediately to clean up any accidental tailings spill. In any event, exposure to spilled tailings would not be hazardous to public health over the short duration of exposure.

It also should be noted that the likelihood of an accident is extremely low. To date, about 75,000 cy of tailings have been moved by about 5000 trucks at the Salt Lake City site and only one accident has occurred. No injuries/deaths occurred.

7. Comment

The DEIS does not address the problems of repair or reconstruction of roadways and utilities damaged by the heavy traffic of large dump trucks over the period of the project. My concerns are the loaded trucks going East on D Road (the most logical route) to the Cheney Reservoir site.

The Central Grand Valley Sanitation District has a clay pipe sewer system crossing under and adjacent to D Road. Traffic could severely damage those segments of the system. Interruptions in the traffic flow due to repairs and/or replacements being made to the system would cause problems for the project. The cost of those repairs and/or replacements must also be identified with the project (12).

Response

Although maintenance of city, county, and state highways is not a project responsibility, estimates of highway maintenance costs have been provided by county officials and are included in the responses of Section 6.5.

8. Comment

Transporting the tailings material from the Grand Junction site by train would result in the fewest negative impacts, particularly with respect to public safety and condition of city streets (24).

Response

As noted by the commentor and as shown in Table 1.1, transport to the Cheney Reservoir or the Two Road sites by train would result in four to five less injuries than transport by truck although no fatalities are anticipated in either case. However, other impacts except cost, are similar; transport by train would cost $37 million more.

9. Comment

Many commentors were concerned with road maintenance, and damage from remedial action. Who will pay (3, 10, 18, 23, 24)?

Response

As noted in response 7, maintenance of city, county, and state highways is not a DOE responsibility. However, it should be noted that about $1 million in fuel tax, ton-mile tax, and registration fees will be generated to the state from remedial action. These funds will be used for disbursement for road maintenance and upgrade. Also see response to Comment 7, Section 6.5.

10. Comment

The congestion in Whitewater, if the tailings were trucked to Cheney Reservoir, would impact the area in an unfavorable way. It's already difficult to get onto the highway from "The Whitewater General Store" or the main streets of Whitewater (19).

Response

The DOE agrees that additional traffic and resulting congestion is inevitable; however, it will be minimized to the extent practicable.

11. Comment

The bridges and roads from Ten Road to Two Road are county-maintained roads and bridges, which are already in very poor condition with no money for needed improvements. I don't feel that they would accommodate any type of heavy truck traffic; they would just totally deteriorate (11).

Response

Clearly these roads would require additional maintenance and improvements. Also see responses 7 and 9.

12. Comment

If DOE would build a spur off of Mack to Two Road, there would be no trucks involved. The train would be loaded in Grand Junction, go to Mack, and from there to Two Road. The tailings wouldn't be transferred again whatsoever. There would be no truck traffic (2).

Response

The DOE agrees; however, train transport all the way to the Two Road site will add $65 million in public cost to the project (over the truck transport to the Cheney Reservoir site alternative).

13. Comment

An alternative using rail exclusively to the Two Road site should be presented and analyzed in detail in the FEIS. Included in this analysis should be the potential for use of the old Uintah Railway alignment and the possible future uses for the Sheridan and Fruita coal mine complexes (2, 9, 10, 20).

Response

As noted in response 7, Section 6.5, an all-rail alternative would cost an additional $14 million above the $107 million for truck/train transport. Because of this much higher cost and the other reasonable alternatives, this alternative is not reasonable for inclusion in the FEIS.

14. Comment

The old UN Railroad bed crosses quite a bit of property and I don't think it would be suitable for tailings transport (10).

Response

DOE concurs. The old Uintah Railway bed (where it still exists) is narrow and has steep grades. A spur from Mack to the Two Road site would need to be totally rebuilt.

15. Comment

If the railroad were used, there would not be the traffic congestion that would result from truck transportation of the tailings. Since the railway system runs near the Two Road site, the cost would be far less than constructing a rail system all the way from Whitewater to Cheney Reservoir (19).

Response

DOE concurs that rail use would avoid traffic congestion that will result from truck transport. Preliminary investigation also indicates that extending rail all the way to the Two Road site would cost less than extending a rail system from Whitewater to the Cheney Reservoir site (which may be infeasible due to the grades involved and the problem in crossing the Kennah Creek drainage).

16. Comment

We request the FEIS to include data on rail system use for Vitro site, including traffic accidents and spills (22).

Response

As of July 25, 1986, approximately 1.33 million cy of tailings had been relocated by rail to a site about 80 miles west of Salt Lake City, Utah. No accidents have occurred through use of the railroad, whereas one accident through use of truck transport has occurred (see response to comment 6.6.6).

17. Comment

I could find no reference as to size of trucks used for hauling tailings - five-yard? 10-yard? or what? Do you intend to have all trucks secured at night so they will not move about the community with their radioactive dust? This should be covered in your FEIS as these vehicles will become radioactive (23).

Response

Tables B.5.1, B.5.3, and B.5.7 of the DEIS provide the requested truck capacity information for the alternate sites. Table B.5.1 has been modified to indicate a 10-cy truck with 8-cy pup capacity (see Errata Sheet, Section 6.25). Trucks will be checked for and cleaned of all radioactive materials (in a designated decontamination area) before being allowed to travel on public roads. After cleaning, the trucks will not be radioactive.

18. Comment

I could not find any reference as to when the hauling would occur. Do your plans call for daytime hauling only - 8 a.m. to 5 p.m.? Would there be any other hours of hauling (23)?

Response

Hauling would occur only during daylight hours.

19. Comment

Disclose impact of mill tailing losses during transport to private, commercial, and public property (20).

Response

Impacts to properties due to a sudden release of tailings during an accident will be minimal. As noted in Section 5.1.5, any spills (by truck or train) would be promptly cleaned up. Also, as noted in Section 5.20.1, all trucks/trains will be covered or otherwise sealed to prevent the inadvertent release of tailings.

Also see response 6 above.

20. Comment

One commentor felt that there are potentially greater impacts of increased traffic over the entire haul route to the Cheney Reservoir site than there are for the Two Road site, although another felt just the opposite because of the better transportation network (8, 20).

Response

As shown on Table 5.11, the current average daily traffic volume is similar for remedial action at the Cheney Reservoir and Two Road sites. Highway routes are selected with consideration for congestion at ingress and egress points, haul distances, and other factors. Projected accidents are based on accident rates compiled for the segment under consideration when such data are available. The occurrence of accidents is known to correlate with more than the number of traffic lanes. Factors such as pavement surface, presence of shoulder, passing lanes, and others influence the frequency of accident occurrence.

21. Comment

It is not clear how the DOE will monitor the haul trucks to ensure adequate covering of the loads, vehicle maintenance, and driving practices. With an estimated 27 trucks per hour per day for the next three years, problems of this nature will arise and could have significant negative effects on populations residing near haul routes and on traffic (2, 9).

Response

The remedial action contractor will develop a site-specific Health Physics Monitoring Plan and health physics procedures that will be applied prior to construction start. These procedures are designed to ensure that loads are transported in a manner that will not result in loss of tailings. Copies of these plans will be made available to the public upon request. Although vehicle maintenance and driving practices are the responsibility of the successful subcontractor, DOE and its contractors will do what is necessary to ensure that the subcontractor carries necessary insurance and adheres to his "safety" obligations under the contract.

22. Comment

Potential accidental spills of tailings are not projected. Also, cleanup procedures are not described (20, 22).

Response

As noted in response 6 above, the potential for spills from accidents is very low.

23. Comment

Include process for local input and approval of Transportation Route Plan and Accidental Spill Contingency Plan. These plans are to be developed before contracts are awarded (20).

Response

The inclusion of the process by which the Task Force will be involved and the extent of that involvement in the selection of the detailed haul routes and mitigations and details of a spill control plan is beyond the scope of this EIS.

24. Comment

The more you move it, the more you're looking at possible spills. The more you traffic it out, the more you're looking at possible accidents (3).

Response

The DOE agrees, however, the potential for a spill and the impact to the public if a spill occurs will be negligible. Estimated accident rates are included in Table 5.16.

25. Comment

The impacts from transportation are quite large. There will be a great deal of congestion and disruption of the traffic patterns in the community, and this will make transportation the single most important and sensitive issue for local residents.

The importance of this issue is further highlighted by the fact that transportation costs were the pivotal consideration in identifying the preferred alternatives. Therefore, under the discussion of alternatives I expected to find a thorough discussion of possible routes and methods available to accomplish the program. However, only one sample route was discussed for each alternative.

After reading the section on impacts, I am concerned that the economic analysis of transportation costs used to select the preferred alternative did not take into account the real costs of road maintenance and personal injury and property damage due to increased accidents. These costs are very route specific and because of the lack of discussion of alternative routes, there is no indication that they were considered in the total cost, which was the deciding criteria.

With this in mind, I suggest a closer look at alternatives 4 and 6 involving a combination of train and truck transport (5).

Response

Because they are not project costs to be borne by the DOE, the costs of road maintenance and personal injury and property damage due to increased accidents are not included in the comparative costs reflected in Tables 1.1 of the FEIS or B.5.15 of the DEIS. Additional information received from county and state highway representatives since publication of the DEIS on the cost of road maintenance does not support train and truck transport (Cheney Reservoir $93 million vs. Two Road $107 million) as having an overall lower total cost than truck only transport (Cheney Reservoir $56 million vs. Two Road $77 million).

26. Comment

Page 195, paragraph 4. Significant road damage can be expected on SH 141 heading south after crossing the bridge over the Colorado River. Table 5.13 indicates a relatively low total weighted rating for this road. In addition, the Mesa County Planning Commission, the Grand Junction Task Force, and the Mesa County Engineering Department have concerns with the proposed use of county roads which have not been adequately addressed in the DEIS. Included in these concerns are impacts resulting from noise, traffic congestion, public safety (e.g., D Road is a narrow two-lane road, has no shoulders, and is a school bus route), and road upgrading/maintenance costs (26).

Response

Noise, traffic congestion (in the form of increased road use), and safety (accidents anticipated) have been estimated and are provided in Sections 5.8, 5.13, and 5.15 based on all available county data. Although not a project cost per se, road maintenance costs have been estimated; see response 7 of Section 6.5 and responses 7 and 9 of this section.

27. Comment

Funds for road maintenance are provided to Mesa County by the State of Colorado according to the number of miles of open roadway. There is no direct application of road use tax or other truck use income to Mesa County for damages caused to certain segments of these roadways due to extraordinary/unusual peak use (26).

Response

This is correct. However, as noted in response 9 above, the state will receive about $1 million in fuel tax, ton-mile tax, and registration fees from remedial action.

28. Comment

The Department of Highways has planned a bridge replacement project for the west-bound Fifth Street Bridge during 1988-1989. The total duration of this construction project is estimated to be approximately six to eight months (possibly to one year). The DEIS needs to address this major temporary traffic congestion problem (26).

Response

As noted in response 1, the DOE is investigating the possibility that the 5th Street Bridge and tailings relocation could be phased rather than concurrent. The DOE will work closely with the state Department of Highways on this issue.

29. Comment

Page B-53, paragraph 5, 4th sentence - recommend rephrasing as "Areas of concern include the entire route within the Grand Junction city limits, D Road from 15th Street to S.H. 141, the two-lane reaches . . ." (26).

Response

Agreed. This page of the DEIS should be modified. See the Errata Sheet, Section 6.25.

30. Comment

The intersection of US 50 and the Cheney Reservoir disposal site road will require the DOE to submit an access permit for this haul road access point. As a safety consideration, we will request that this intersection be fully channelized to include a left-turn lane and an acceleration lane to meet current design standards. A blank access permit has been included with this letter for your use when the project nears the implementation/construction stages. In addition, because of potential traffic conflicts with the intersection of SH 141 and US 50, signals may have to be installed or flagmen used at this intersection during hours of extensive truck haul (26).

Response

The DOE appreciates this comment and will comply with provisions of the required permit.

31. Comment

Accident rates, including fatalities, are significantly lower for truck/rail transportation. Rail-only accident rates are probably lower and should be included (22).

Response

Since the cost of an all-rail alternative is so much more costly than train/truck and, thus, is unreasonable, this alternative has not been included in this FEIS.

6.7 BORROW SITES

Three commentors were concerned with the selection of Unaweep Canyon as a possible borrow site for the SOS alternative.

1. Comment

The Department of the Interior, the Mesa County Planning Commission, and a private individual were concerned with the possible development of a borrow site in Unaweep Canyon. The Draft EIS indicates that a borrow site in Unaweep Canyon would be used for extraction of borrow materials to supplement on-site rock for capping the tailings pile. There is no permitted site in the vicinity of this proposed borrow pit for extraction activities. Further, the location proposed for extraction is in an area noted for wildlife, unusual vegetation, and scenic value; the appropriateness of extraction is questionable (9, 25). Further, there are permitted sources available (15).

Response

The DOE recognizes the sensitive environmental resources present in Unaweep Canyon. It is also recognized that sources of large diameter rock other than that indicated in the DEIS exist in the Grand Junction area. The source identified in the DEIS was chosen in order to provide a conservative estimate of environmental impacts associated with the SOS alternative.

If the SOS alternative were to be selected, a detailed borrow source investigation would be conducted to find the most economical source of rock that meets the erosion protection size and durability requirements, and would minimize environmental impacts. Regardless of the borrow source, the DOE and the construction contractor will meet all required permit requirements during extraction and restoration.

2. Comment

It is not sufficient to merely refer to "material" as was done in Section 3.2.8. The specific soil, rock, or deposit which will come from a specific site should be identified. This is important because the physical properties necessary for the specified uses, i.e., radon cover, erosion cover, fill material, and capillary break, are diverse and the properties are use-specific (25).

Response

Section 3.2.8 describes the types of materials available at each of the borrow sites. The specific physical properties pertinent to construction specifications and "the specific soil, rock, or deposit which will come from the specific site" will be determined during final design and development of the construction specifications. The borrow sites presented in the EIS have suitable materials in sufficient quantities and were chosen in order to provide an estimate of environmental impacts for the different alternatives.

6.8 SURFACE WATER

Several comments focused on possible impacts to water quality from storm events that might erode the stabilized Cheney Reservoir site. Others were concerned with meander of the Colorado River and its effect on the SOS alternative.

1. Comment

I have an irrigation ditch that runs within a half mile of the Cheney Reservoir site, and it is seasonal, but it contains a substantial amount of water that runs as high as 15 to 20 feet per second at certain seasons of the year. In addition, the pitch of the terrain and the site's location at the foot of Grand Mesa would act to collect drainage in severe storms. I witnessed a storm in 1976 that would be considered a one in 100-year flood; the conduit under the highway was spurting water from the lower side full pipe and this came from the area that's being proposed for the mill tailings site (1, 18).

Response

A detailed analysis of the topography and hydrologic conditions at the Cheney Reservoir site was performed in support of the EIS. This work is presented in Appendices B, E, F, and G of the DEIS and is summarized in the FEIS.

In summary, the proposed pile at the Cheney Reservoir site would be covered with a rock layer designed to withstand the runoff from the largest storm meteorologically possible in the region (see Section B.6.1.2 of the DEIS). This does not imply that large storms with severe runoff conditions do not occur in the Cheney Reservoir site area. However, the proposed pile design would be able to withstand the erosional effects of these, and larger, storms.

2. Comment

The DEIS indicates that there are intermittent streams and an irrigation system near the Cheney Reservoir site. This raises questions for long-term water quality and possible effects on grazing animals which were not given suitable weight in the evaluation process (4, 20).

Response

As noted in response 1, the Cheney Reservoir site has been designed to withstand the erosional forces of the largest rainfall and flood event possible. Since the cover system will not erode, tailings will not be exposed and surface waters will not be affected. Grazing could continue unaffected.

3. Comment

Our observation of local factors confirms the DEIS analysis that a repository at Cheney Reservoir would have significantly more impacts than a repository at Two Road due to larger drainage area, plus more intermittent streams and irrigation ditches near the site (22).

Response

The size of the drainage area and the presence of the ephemeral channels near the site were fundamental in determining the pile design, location, and erosion protection features.

Regardless of the site chosen, pile cover design will eliminate impacts to irrigation ditches or any surface-water bodies as a result of the larger drainage area or the presence of the intermittent streams.

4. Comment

Two Road has less rainfall compared to Cheney Reservoir and thus erosion problems are less (9).

Response

The erosional processes active at either site are not only dependent on rainfall but also on the topography and the characteristics of the surface and near-surface materials. Because of these factors, the conceptual designs for both sites meet EPA standards concerning surface-water runoff and erosion protection.

5. Comment

Alternative 2 (stabilization on site) is unacceptable because it is located within the 100-year floodplain (20).

Response

The SOS alternative has been designed to withstand the Probable Maximum Flood and thus would be unaffected by the 100-year flood. However, if this alternative were ultimately chosen, all applicable permits would be obtained for constructing in the 100-year floodplain.

6. Comment

The EIS should include a discussion concerning the source and location of water needed for project purposes at the Cheney Reservoir site and other sites. If surface waters are to be used, this may adversely impact wildlife resources and mitigation may be required. If a deep well is drilled to obtain water for equipment decontamination, compaction, and dust control, the EIS should estimate the quantity of water needed for these uses, evaluate impacts of the withdrawal on the aquifer and on surrounding wells, and describe the manner of deep-well construction. Disposition of wash water from the construction vehicles should also be addressed (25).

Response

Providing water for construction purposes will be the obligation of the construction contractor. The contractor will be required to file and comply with all applicable permits.

For purposes of this EIS, a conservative estimate of construction water requirements (see Sections 5.5.1 and 5.14) was determined in order to compare the different disposal alternatives. There would be no detrimental environmental impacts resulting from the disposal of the tailings regardless of the alternatives, as all contaminated water (resulting from dewatering or vehicle wash) would be either treated or evaporated and possibly used for moisture control of contaminated areas. Uncontaminated water would be used for dust control on clean areas.

Should a surface-water source be selected, efforts will be made to minimize effects to downstream users (including wildlife). If a deep well is to be constructed, its manner of construction, effects on the aquifer, and the like will be determined during the permitting process.

7. Comment

This Section 3.2.6 should discuss the source of water needed for stabilization of the tailings pile, dust control, and the truck wash station for remedial action at the Two Road site. This site may have a better source of water than at the Cheney Reservoir site since the Government Highline Canal waste water enters West Salt Creek near the Two Road Site. This water may be available during the irrigation season for use at this site (25).

Response

See response 6 above.

8. Comment

Page 79, paragraph 3, 3rd sentence - recommend rephrasing as per sentences #1, 2, and 3, page E1-17, Section E.1.4.2.1. The current phraseology is misleading (26).

Response

The text sentence accurately summarizes the more detailed Section E.1.4.2.1.

9. Comment

Page 80, paragraph 1, Schumm and Harvey's (1983) conclusion was that "the Colorado River is likely to change the position of its dominant channel through time and therefore lateral shift of the river is expectable at the site. The island-braided pattern of the river in the vicinity of each site would tend to confirm this." It may be appropriate to include this information here (26).

Response

The potential for meander toward the site is summarized in Section 4.6.1. A detailed geomorphic description is contained in Appendix E, Soils, Geologic, and Seismic Information, of the DEIS.

10. Comment

Page 157, paragraph 1, remedial action at vicinity properties could affect surface waters (26).

Response

Agreed. Text Section 5.5.1 has been revised.

11. Comment

Interpretation of radionuclide concentrations in sediment samples requires identification in terms of wet weight or dry weight (page 98). If the former, moisture content data also should be provided (27).

Response

Sediment samples are analyzed for radionuclides after the samples have dried.

12. Comment

Meaningful interpretation of radium-226 results for the Colorado River require identification of these data as "total" or "dissolved" concentrations (27).

Response

The Ra-226 results reported for Colorado River water are total concentrations.

13. Comment

Page 69, paragraph 1. It would be more correct to say "The channel morphology of the Colorado River adjacent to the site is island-braided. Recorded information indicates that the river has been stable at this location for about the past 100 years. Upstream and downstream . . . ." (26).

Response

Agreed. Text Section 4.5.1 has been revised.

14. Comment

Section F.1.2.1, Grand Junction Tailings Site, (PMF hydrologic analysis), page F-21: The modified Puls methods was used to route flows through primary channel reaches. This routing method which uses storage-outflow relationships is generally used for reservoir routings where it gives quite satisfactory results. For open channel routing, however, it usually gives poor approximations. Additional information is needed to describe how the modified Puls methods was used to route flood flow along the Colorado River and to show that the computed flood level elevations are conservative (28).

Response

The modified Puls method does give different results for open channel routing than for reservoir routings, due to the reduced channel capacity. However, the effects of storage are negligible and do not dampen the estimated peak discharge. The modified Puls method was used in order to incorporate a routing time delay into the model. The design discharge, and therefore the computed flood level elevations, was developed using conservative assumptions; however, if the SOS option is chosen as the preferred alternative additional hydrologic analysis will be performed. This analysis will include a comparison of the current PMF discharge to a discharge estimated by using an estimated velocity to determine route times.

6.9 GROUND WATER

1. Comment

In our review of the DEIS we noted that the permeability and potential failure of the compacted layer, with possible contamination of the ground water at the Cheney Reservoir site, are not fully considered (22).

Response

A slope stability analysis was performed and was discussed in Section B.6.3.2 of the DEIS. This analysis concluded that the safety factors against embankment failure were greater than the minimum required, and therefore, the stabilized site would not fail and cause the concerns mentioned. A more detailed stability analysis, specifically involving the radon cover material, has been included in the draft remedial action plan (DOE, 1986a); its conclusions were the same as those of the DEIS.

2. Comment

Quite a few of the residents in the Kannah Creek area are using well water at this time, and if the present contract with Grand Junction to furnish domestic water is not renewed, there may be more wells drilled in the future. I do not feel that there is any assurance that this site would not contaminate the underground water supply in this entire area (18).

Response

Wells that exist in the Kannah Creek area are completed beneath the Mancos Shale. The unsaturated Mancos Shale, which is several hundred feet thick beneath the Cheney Reservoir site, acts as an effective barrier to downward movement of any leachate generated from the proposed disposal site (see Section F.4.3.1 of this FEIS).

3. Comment

I oppose the tailings dump site at Cheney Reservoir. There is a lot of underground water in the Kannah Creek area. The water level is very high in some places. There is also more rainfall in this area than in the Two Road area. To put a tailings dump where contamination could get into the drinking water for this area and other areas of the Grand Valley is outrageous. If the Dominguez Reservoir goes into construction on the Gunnison River near Whitewater, it could contaminate the entire reservoir (19).

Response

The perched, poor quality ground water above the Mancos Shale is not connected with the potable aquifers beneath the shale. The rate of contaminant seepage would not reach these aquifers and lateral seepage may not even reach Indian Creek (i.e., no or negligible impacts to the Dominguez Reservoir). More field tests and analyses including well drilling, water sampling, and water-level measurements will be conducted to define the potential seepage conditions. This additional testing and analysis may result in refinements to the design to ensure adequate water resource protection but will not disqualify the site or cause any major design changes.

4. Comment

The water table at the Cheney Reservoir site is of a significant nature. There is a higher water table in our area than there is at the Two Road site (1).

Response

The water table at the Cheney Reservoir site represents minor perched saturation on top of the Mancos Shale. This water has very limited use due to its small quantity and poor quality.

The commentor is correct; the water table is deeper at the Two Road site.

Also see responses 2 and 3 above.

5. Comment

Our observation of local factors confirms the DEIS analysis that a repository at Cheney Reservoir would have significantly more impacts than a repository at Two Road due to the presence of a shallow aquifer on the Cheney Reservoir site (20, 22).

Response

The shallow, perched saturated zone at the Cheney Reservoir site is not considered an aquifer due to its limited quantity and poor quality of water.

Also see responses 2 and 3 above.

6. Comment

Should the FEIS retain Cheney Reservoir as the preferred alternative, we request that more analysis be included on protection of water resources, e.g., repository liner and thicker cover (22).

Response

More analyses are planned following collection of additional field data. Analyses will be conducted to refine the present design to enhance protection of water resources. The results of the analyses will be reported in the final design.

7. Comment

How will leaching be prevented (4)?

Response

A low-permeability, sloping cover will limit infiltration of rainfall and snowmelt which in turn will limit leachate production.

8. Comment

Are there any guarantees that the present site can be totally decontaminated, or that contamination hasn't already seeped into the ground underneath the present site to a degree that it can't be totally decontaminated? If not, why contaminate even more land and expose even more people (19)?

Response

There are no guarantees that the Grand Junction mill site can be "totally" decontaminated; however, the DOE can guarantee that, if the tailings are relocated, the EPA standards for cleanup of open lands will be met. The decision to relocate the tailings will be based on environmental factors, health risks, costs and other factors. The Record of Decision will state these reasons for this decision.

9. Comment

The Water Resources column of Table 1.1 doesn't address the effect on ground water at vicinity properties in alternative #1. There are thousands of tons of tailings around storm sewers, water lines, and other utilities (26).

Response

Agreed. Table 1.1 and Section 4.1 have been modified appropriately.

10. Comment

Two main components of ground-water flow within the alluvium are described: [near the river, the flow is] "generally parallel to and in the same direction as flow in the river . . . Away from the river to the north, flow is more generally toward the river." Water level contour maps in the area of the processing site (Figures F.3.11 thru F.3.13) indicate that the prevailing ground-water flow direction beneath the site is very sensitive to seasonal and yearly variations in runoff rates in the Colorado River. The iso-concentration contour map of uranium in alluvial ground water, Figure 4.11, suggests that there may be intermittent components of ground water direction from the river toward the site (e.g., during periods of high runoff). Potential changes in flow rates and directions of contaminated ground-water migration caused by such episodes of periodic recharge from the river need to be assessed. What impacts, if any, would these changes have on the future geometry, location, and duration of the existing plume and on possible future water use (26)?

Response

The data base has been augmented with an additional set of water level measurements from July, 1986. The variability of flow ratio and directions has been assessed based on this data set and from previous measurements. These additional data and analyses will be reported in the final design. Also, solute transport modeling has been added to Section F.3.2.4 of this FEIS.

11. Comment

Aquifer recharge to the river at the mill site is discounted because of dilution potential. However, it is enough of a surficial aquifer problem in the area that its contribution to river loading was sufficient to assign a damage value for downstream (F-154). This subject merits further discussion at this point (26).

Response

The effects of dewatering during excavation and the costs and benefits of additional efforts toward aquifer restoration will be addressed in detail in the final design following additional data collection. Also, discussion has been added to Sections F.3.2 and F.3.8 of this FEIS to indicate the very conservative nature of the aquifer restoration costs and prediction of contribution to the river. The DOE believes that the discussions of these issues is sufficient for purposes of the EIS.

12. Comment

The predictions of possible maximum concentrations of uranium in the shallow ground water for the stabilization on site alternative - 8.8 to 52 pCi/l, to 39 to 235 pCi/l after 100 years - suggest that uranium and other plume contaminants could persist in the local ground water for several hundreds of years. Excavation activities at the processing site could also result in (an) additional pulse(s) of contamination being introduced into the ground-water environment. What is the time table for natural cleanup of this ground-water system? The future behavior of the current suite of contaminants should be modeled in more detail (26).

Response

The requested solute transport modeling has been added to Section F.3.2.4 of this FEIS.

13. Comment

Page 158, paragraph 5, 2nd sentence - What direction(s) is(are) considered downgradient (26)?

Response

Section 5.5.2 has been revised to clarify "downgradient."

14. Comment

The mixing cell model does not take into account geochemical retardation effects and does not specifically include dispersivity. Incorporation of these assumptions could greatly increase the time required for natural cleanup (26).

Response

The solute transport modeling added to Section F.3.2.4 of this FEIS specifically includes the effects of dispersivity and retardation. These analyses indicate ammonium and other cations, such as iron and manganese, may persist in the ground water for a long time for natural cleanup or for enhanced ground-water cleanup. Natural cleanup for anions, such as chloride and fluoride, would require less time than the cations.

15. Comment

It is stated that current levels of contaminants in the Mancos Shale will persist into the future. It is noted on pages 83 and F-49, however, that the Mancos Shale is locally absent approximately 0.5 mile west of the pile. What effect will this hydrologic connection between the alluvial aquifer and the Dakota Sandstone have on the possible eventual contamination of the Dakota aquifer and consequent future spreading of contaminants into the ground-water system (26)?

Response

Solute transport calibrations and simulations were conducted for ammonium, uranium, arsenic, and chloride. A discussion of the procedures and results is included in F.3.2.4 of this FEIS. These analyses indicate that the concentration of uranium at the Dakota Sandstone subcrop will peak in approximately 75 years at 140 pCi/l, ammonium will peak in approximately 175 years at a concentration of 106 mg/l, chloride is presently at a peak concentration of approximately 850 mg/l, and measured and predicted arsenic concentrations do not exceed water quality standards.

16. Comment

The DEIS does not characterize the attenuative capacity of the silts and clayey sediments at the Cheney Reservoir site. The sorptive properties of materials to be used in the construction of the low-permeability layer (liner) and of the surrounding soils at the Cheney Reservoir site should be quantified (26).

Response

The primary geochemical attenuation of leachate from acid-leached tailings is neutralization. The expected neutralization potential of these silt and clay sediments, based on the carbonate content, has been added to Section F.4.1.3 of this FEIS.

17. Comment

Page B-10, paragraph 2, 5th sentence - A minimum vertical separation distance between the calculated expected highest ground-water level and the base of the stabilized pile should be defined through consultation with the NRC and the state. Ground-water mounding could occur beneath the stabilized on-site pile. Changes in the river morphology could also lead to increased levels of recharge to the site from the Colorado River within the 1000-year design life (26).

Response

The DOE believes that the analyses in the EIS are sufficient as is; however, additional analyses to address these issues would be conducted as part of the final design if the SOS alternative were selected.

18. Comment

The cost-effectiveness of a scaled-down restoration effort (e.g., concentrated in the area of the former mill/tailings pile site) utilizing the proposed waste-water treatment unit (e.g., approximately 300 gpm [?]) should be further investigated, and the implications discussed with the state of Colorado (26).

Response

During excavation, dewatering of saturated materials will be needed. Water released from the site would be required to meet applicable state and Federal water quality standards. To meet standards, a treatment plant may be necessary. Additional calculations to determine likely volumes, discharge rates, concentrations of dewatered ground water and its effects on aquifer clean-up, and the costs and benefits of additional efforts toward aquifer restoration beyond those of the DEIS will be addressed in the final design.

19. Comment

Contaminated ground water at the Grand Junction site could have potential impacts for agricultural water resources (26).

Response

Calculations of dilution potential for contaminated ground water entering the Colorado River have shown little or no effect on concentrations of dissolved constituents in the river. Also, the background quality of water in the alluvium and in the Mancos/Dakota aquifers is generally unsuitable for agricultural purposes in the area of the tailings site as a result of both natural dissolutions of solids and input of contaminants from other sources in the vicinity of the site.

20. Comment

Estimates of infiltration rates at the Cheney Reservoir site and the processing site show a wide range of values. The assumptions used to calculate infiltration rates appear to govern these rates. The state would like to work closely with the DOE to better define estimates of infiltration, to develop more realistic projections of future contaminant flux rates, and discuss potential cover and designs to mitigate any adverse conditions and/or impacts to ground water (26).

Response

Agreed. Refinement of design features to address these issues will occur during preparation and review of the final design.

21. Comment

In order to minimize further contamination of the local ground-water system during the extensive excavation activities, the DOE should consider performing interim aquifer restoration (e.g., pumping and treatment) of contaminated ground waters in the shallow alluvial aquifer beneath the processing site. Use of the proposed water treatment unit could be optimized, and partial removal of some or most of the higher concentrations of plume contaminants in the sub-pile ground water would also be accomplished. The economic and technical feasibility of such an effort would also be enhanced by the use of whatever system of ground-water/surface-water intrusion control is selected (e.g., sheet-pile system or clay-filled (slurry trench)). Cost/performance effectiveness estimates should be evaluated for this clean-up effort (26).

Response

This comment has merit and the requested information and analyses will be included in the final design.

22. Comment

The use of Bureau of Reclamation wells 711 and 712 appear to be good choices for defining background alluvium water. However, wells 588 and 744 may not represent "true" background conditions. Well 588 is directly downgradient from the site, and well 744 is approximately 750 feet lateral to the site. The presence of vanadium in the February '83 chemistry of well 588 appears to confirm that the future use of these wells for defining background may lead to difficulties in interpreting the collected data (26).

Response

Although wells 744 and 588 may represent background, it is agreed that the locations of wells 711 and 712 are more clearly background. Therefore, Section F.3.1.6 has been revised to include only wells 711 and 712 as background.

23. Comment

Well 743 may not adequately define the background water quality for the Mancos ground water. This is due to the likely presence of cement contamination observed in the reported analytical results for this well. In addition, this well, according to the water table contour map on page F-57, is not hydraulically upgradient from the site, but rather is lateral to it (26).

Response

Well 743 has been sampled three times; pH measurements of 10.2 and 11.4 were reported in the DEIS and on July 24, 1986, pH was 8.5. These readings may or may not indicate grout contamination. Due to the high concentration of ammonium, the pH of the ground water may be in the alkaline range. Based on Figure F.3.12, well 743 is not beneath or downgradient of the contaminant source, rather it is crossgradient with respect to the direction of flow in the alluvium. Therefore, its position is acceptable as a background well. The statement, regarding the hydraulic position of well 743, in Section F.3.1.6 has been modified.

24. Comment

The method for selecting a background well to represent ground water from the Dakota Sandstone appears to be well founded, but well 725, along with several other wells in the monitoring program, may have been completed improperly. Except for a few extremely rare geological settings, pore water from sandstone does not have a pH of 12.6, as is reported for this well on page F-109 of the DEIS. According to Langmuir, 1986 (personal communication), extremely elevated values of pH in a monitoring well are almost always an obvious sign of cement contamination within the well (Don Langmuir, Professor, Department of Geochemistry, Colorado School of Mines, Golden, Colorado). Wells 729, 731, 735, 741, and 743 also exhibit this diagnostic sign of improper completion. Thus, the statement made on page 84 of the DEIS with regard to Mancos Shale water having a pH value outside the range established for EPA drinking water standards should be modified. Since wells suffering from this problem were used to define background conditions for the processing site, we believe that "background" has not been adequately characterized to date (26).

Response

The following table shows the values of pH for the suspected grout-contaminated wells during three sample sets, the first two reported in the DEIS and the third collected in July, 1986:

Well ID	March/April 1985	June 1985	July 1986
	pH		
725	12.6	11.9	9.1
729	11.5	9.2	9.1
731	12.6	12.5	11.8
735	11.8	10.8	9.4
741	9.2	8.7	8.2
743	10.2	11.4	8.5

The pH values indicate that all wells may have had some grout in or around the well during the first sampling program and possibly during the second program. The most recent measurements indicate pHs in a range acceptable for alkaline water with the exception of the reading for well 731. The statement regarding the pH of water in the Mancos Shale has been removed from Section 4.6.2 of the EIS. The most recent sample from well 725 is a reliable representation of background.

25. Comment

It is most likely that the high value of ammonium and uranium reported in well 710 can be interpreted as evidence of contamination from the Grand Junction site. We do not agree with the statement that these facts provide uncertain evidence for contamination. We feel that the presence of these ions can be used as evidence for contamination (26).

Response

An iso-concentration contour map of the site plotted with data from alluvial wells shows a definite ammonium plume beneath the site; it appears from the contour map that the ammonium plume affects the quality of water in well 710. The discussion about ammonium in Section F.3.1.6 of this FEIS has been revised.

26. Comment

From an examination of the measured concentrations of molybdenum in the monitoring wells located downgradient to the site, there appears to be evidence of a molybdenum plume leaching from the site. The DEIS concludes that this is not the case, but inspection of the data lead to the conclusion that a plume exists. The elevated concentrations of molybdenum at the processing site, and in seven wells located downgradient to the site, indicate that a molybdenum plume exists (26).

Response

An iso-concentration contour map of the site plotted with analytical data from alluvial wells shows what is probably a small plume beneath the southwest corner of the site; there does not appear to be definitive evidence of that plume affecting wells downgradient of the site. Furthermore, wells upgradient of the site (739, 737, 746) have higher concentrations of molybdenum than do wells downgradient of the site. The discussion concerning molybdenum in Section F.3.1.6 of the DEIS is accurate.

27. Comment

Considering the substantial amounts of selenium that are found in the processing site wells and the potential high mobility of this element, it appears reasonable to assume that the tailings might be leaching out a plume of selenium to the downgradient alluvial system. Presence of elevated levels of selenium in three downgradient wells appears to be evidence for the existence of such a selenium plume. The levels in wells 725 and 729 may be a reflection of the apparent naturally elevated background conditions, but well 735 provides cause for further monitoring (26).

Response

An iso-concentration contour map of the site plotted using analytical data from alluvial wells shows what is probably a small selenium plume beneath the southwest corner of the site; if a plume exists in the alluvium then it is confined to a very small area beneath the site in the direct vicinity of well 584. There is no evidence of a selenium plume in the alluvium moving downgradient of the site. An iso-concentration contour map of the site plotted using analytical data from Mancos/Dakota wells shows a spotty, inconsistent distribution of selenium beneath and west of the site. It is highly unlikely that the elevated concentration of selenium observed in well 735 is a result of contaminant migration from the tailings site where bedrock wells located between well 735 and the tailings site have selenium concentrations close to or less than the lower detection limit (wells 724 and 740). Based on the spotty distribution of selenium in the vicinity of the site, sources other than the tailings are suspected. Any further monitoring of well 735 should be done in conjunction with the delineation of sources of contamination in the direct vicinity of that well.

28. Comment

There appear to be many inconsistencies in the relationship between conductance and total solids for the majority of analyses reported in Table F.3.7 of the DEIS. The conductance multiplied by a factor less than one (often about 0.59) will yield an approximate value for TDS. According to Hem, 1985, p. 164, "the dissolved-solids value in milligrams per liter should generally be from 0.55 to 0.75 times the specific conductance in micromhos per centimeter for waters of ordinary composition. . ." (USGS WSP 2254). Table F.3.7 shows many samples with a TDS greater than the conductance, not less. In addition, the TDS values as computed by summation are not in complete agreement with the values reported in Table F.3.7 (26).

Response

For the 33 wells for which there are measured specific conductance and total dissolved solids in Table F.3.7 of the DEIS, the calculated mean conductance multiplication factor ($\frac{TDS}{EC}$) is equal to 0.95 and the median is 0.76. Conductance multiplication factors which are higher than the range 0.55 to 0.75, times the specific conductance in micromhos per centimeter ". . .for waters of ordinary composition . . . ," are common for highly saline waters and waters high in sulfate concentration. According to Standard Methods for the Examination of Water and Wastewater, 1981, p. 31, ". . . for highly saline water [the specific conductance factor] may be much higher than 0.7." In addition, Hem (1985, p. 99) states nearly the full range to be expected is 0.54 to 0.96; higher values are generally associated with waters high in sulfate concentration.

29. Comment

Because of the apparent problems with the analytical quality stated in comment 28 above, a preliminary examination of the cation-anion balance of several samples was performed. "Lack of charge balance is a meaningful clue to the errors in analyses and a large error probably makes a solution unsuitable for reaction simulation" (Parkhurst et al., USGS Wat.Res.Inves.-80-96, p. 21). Four analytical results were computed for balance, and two were found to have serious problems. In view of this, we recommend that cationic-anionic balances reported for laboratory analyses be included in the DEIS as an assessment of the quality of the analytical results. Analytical results used in the ground-water evaluation should be within a cation/anion balance of less than five percent (26).

Response

All analyses of samples collected in 1985 and later and analyzed by one of our contract laboratories are required to have a cation/anion balance of absolute value less than five percent. The errors in results from earlier samples probably are due to ammonium not being analyzed. Several of the samples analyzed in 1985 also show errors with absolute values greater than five percent. The balance for all samples is reported in Sections F.3.1.6 and F.4.1.6 of this FEIS.

30. Comment

The text of this section reports the March value of uranium in well 739 to be 60 pCi/l. Yet on page F-122, the table of chemical analyses reports a March value of 8324 pCi/l for U-234 in this well. This contradiction should be corrected (26).

Response

Both reported values for U-234, well 739, March 22, 1985, are in error. The value should be 34 pCi/l; Table F.3.10 has been revised accordingly.

31. Comment

The available data on background levels for uranium indicate that the maximum background value for uranium at this location should lie between 23 and 33 pCi/l. The two wells to the north and northwest, with reported values of 58 and 60 pCi/l, are clearly above this range of maximum background levels. These wells reflect contamination and should be described in the DEIS. In a similar fashion, it appears clear that well 710, with a value of 52 pCi/l, also reflects contamination from the tailings (26).

Response

As stated in the DEIS, Section F.3.1.1, background concentrations of uranium in shallow ground water reach at least 40 pCi/l, as seen in background well 712. Cross-gradient wells 737 and 739 may or may not be contaminated by the uranium plume; however, as is also correctly stated, the variability of background concentration and the lack of correlative indicators of contamination in wells 737 and 738 preclude stating definitely that these wells are contaminated as a result of the tailings site. Similarly, well 710 may be contaminated as a result of the tailings site. It is possible that because well 710 is pumped at certain times during the year, recharge to the well may be induced; this would explain why the well, which is generally upgradient from the tailings site, is affected by a uranium plume which originates at the site. Also, high concentrations of ammonium (45.0 and 24.9 mg/l) indicate that water sampled at well 710 may be affected by contamination from the site.

32. Comment

The area of elevated zinc contamination should be delineated on a base map of the site (26).

Response

Only seven wells report zinc concentrations in March, 1985, which are higher than the estimated background concentrations of 0.1 mg/l; four of these wells (584,745, 729, and 735) have been described in Section F.3.1.6 of the DEIS. Two of the remaining three wells having zinc concentrations greater than 0.1 mg/l are nested with well 584; these wells are 582 (0.20 mg/l) and 583 (0.60 mg/l). The seventh well reporting a March, 1985, zinc concentration greater than 0.1 mg/l is well 738 (0.20 mg/l). Section F.3.1.6 of this FEIS has been revised to include the previously unmentioned three wells with zinc concentrations greater than 0.1 mg/l. Because of the relatively low number of wells showing zinc concentrations greater than background, an explanation of the wells is more appropriate than a map.

33. Comment

Footnote "a" of Table F.3.9 states that the data in this column came from Table F.3.4. Is not Table F.3.5 (p. F-61) the source of this information? Also, is Table F.3.6 the source for footnote "c", instead of Table F.3.5 (26)?

Response

Correct. Footnote "a" should reference Table F.3.5 not F.3.4, and footnote "c" should reference F.3.6 not F.3.5. Table F.3.9 (now Table F.3.3.4) of this FEIS has been revised accordingly.

34. Comment

Substantiation is lacking for the statement that a sporadic distribution of other contaminants is clear evidence that one or more of the listed attenuative processes is in operation. Sporadic distribution of contaminants could also be a consequence of the design of the monitoring well network, or the natural variability that occurs in contaminant dispersion patterns (26).

Response

It is true that the observed sporadic distribution of selected constituents may be the result of the natural variability that occurs in contaminant dispersion patterns. Aside from the possibility that five of the monitoring wells may be grout contaminated, the monitoring wells and the monitoring well network were designed to detect ground-water contamination, flow, and other features. Section F.3.2.2 of this FEIS has been revised to recognize these other factors.

35. Comment

We agree with the statement that uranium and ammonia have a definable plume. However, we believe that clearly definable plumes of other constituents are present at the Grand Junction site. The DEIS conclusion that other contaminants will be rapidly flushed should be based on model analyses. The use or lack of use of ground water cannot, and should not, be considered when predicting natural cleanup rates of a contaminated water-bearing unit. The assumption that the use of the ground water and its cleanup rate are related is invalid (26).

Response

In addition to ammonium, arsenic, and uranium, plumes exist for chloride, iron, manganese, molybdenum, nickel, and vanadium. These plumes are discussed in Section F.3.2.4 (solute transport modeling) of this FEIS. Also, natural cleanup is discussed in this section. The use or lack of use of ground water is not considered in these predictions.

36. Comment

While there are no data on uranium concentrations within the pore water, page 53 of the study by Markos and Bush shows a well adjacent to the tailings with a uranium concentration of 14 mg/l, or 9333 pCi/l (well 10). Page 54 of the same report shows a sample taken with a uranium level of 3.4 ppm, which is approximately 2266 pCi/l. Considering these known levels, a concentration of greater than 600 pCi/l should be used as the highest level of observable uranium (26).

Response

The uranium levels of 14 and 3.4 reported in the Markos and Bush, 1983a, study are not valid when compared to the 600 pCi/l concentration. The Markos and Bush numbers are also found in the 1983b report of the data. The numbers are reported in units of microgram of element per gram of solid which cannot be converted to the ground-water concentration units of mg/l or pCi/l by any known conversion factors because the analyses were conducted on extracts (elutriations) of solid samples and not on water samples.

Also, well 10 was drilled with a drill rod driven into the soil with a sledge hammer which may have introduced contamination from the surface into the borehole. Therefore the level of 600 pCi/l as the highest level of observable uranium is valid.

37. Comment

In Section F.3.3.2, "Method 2" assumptions do not appear to be conservative (26). Several comments and responses follow.

a. Comment

With regard to the first assumption, significant characteristics of the proposed cover design may modify this statement. There is evidence to suggest that rock covers lacking vegetation will increase infiltration. It has been shown that "rock covers generally increase infiltration and decrease evaporation" (Mayer et al., 1981, PNL-4132, UMT-0207) (Kirkham et al., CSU Symposium, 1982) (26).

Response

Estimate of infiltration rates, cover design refinements, and other factors will occur during preparation and review of the final design.

Also see response 20 above.

b. Comment

Page F-157, assumption number two (infiltration under a snowpack) is not supported. Please provide the documentation for this assumption (26).

Response

This assumption has not been supported with empirical field or laboratory tests or with realistic, theoretical modeling. For the intent of this EIS, this assumption, although undocumented, is realistic. Additional, supported analyses will be prepared for the final design.

c. Comment

When the tailings are unsaturated, the gradient will always be essentially vertical. Further, the conditions described in this assumption would be ideal for setting up lateral _and_ vertical gradients (26).

Response

Agreed. See response 20 above.

d. Comment

The last assumption on page F-157 appears to be invalid. If snows are light and do not remain on the ground long, then they are melting rapidly. Although evaporation of the snowpack by wind action will certainly account for part of the snowpack removal, it will not be the only control acting to remove the snow. The latent heat of fusion for one gram of ice (the heat required to melt one gram of ice into water) is 80 calories, while the latent heat of vaporization (the heat required to evaporate one gram of ice) is 590 calories. The void spaces or "pockets" in the rock cover will shield the snow and resultant melt water from the evaporative actions of wind and sun. Because of these facts, most of the snow will begin to infiltrate as it melts, long before it begins to evaporate. Thus, infiltration of melting snow will most definitely occur, and will probably represent a significant portion of the total amount of water that infiltrates into the impoundment (26).

Response

The comment is clearly valid and will be evaluated during final design.

See response 20 above.

e. Comment

The final two assumptions on page F-157 are also unsubstantiated. If precipitation events equal to or greater than 0.1 inch take place over an average time of 5.5 hours, then the infiltration capacity of the soil is less likely to be exceeded, and Horton Overland Flow (sheet flow) may not occur at all. The net effect of this will be to increase infiltration, not decrease it.

Since the predicted infiltration rate through the cover is based on these assumptions, the values in Table F.3.12 appear to be erroneous (26).

Response

See response to Comment 20.

38. Comment

The section on the saturated zone hydraulics indicates that water levels were obtained in March and May of 1985. This does not appear to be a broad enough timespan to adequately characterize the ground-water regime at the Cheney Reservoir site. On page F-192, Figure F.4.7 shows that there is an irrigation ditch (Whiting's Ditch) that runs nearly perpendicular to the site, at a location approximately 0.5 mile upgradient. The normal period of flow through this ditch is during the summer months. Because this ditch is unlined, a significant amount of water will probably be leaking from the bottom during periods of flow. This might cause a rise in the water table beneath the Cheney Reservoir site beginning at some time later to the irrigation season. The existing data base of water level measurements may not reflect its occurrence. Since the ditch is about 0.5 mile away, this component may not produce significant head differences. However, to rule out this possibility, it is recommended that additional water level measurements be obtained at the Cheney Reservoir site at the end of the irrigation season (26).

Response

An additional set of water level measurements was taken in July, 1986. These measurements are considered in the revisions to Section F.4.1.5 of this FEIS. Also, an additional set of measurements is scheduled for September or October, 1986. These measurements will be considered in the final design documents.

On July 25, 1986, streamflow measurements were made at two general locations along Whiting's Ditch. One location was upstream of the site; the other location was approximately one-third of the way downstream. This second location was where additional diversions would not allow further downstream measurements. The analyses and results of these measurements are reported in Section F.4.1.5 of this FEIS. These results indicated that limited seepage may be occurring, however, this is inconclusive due to the large range of discharge rates measured at the downstream location.

39. Comment

The average linear velocity of the ground water could be understated. The values of hydraulic conductivity used for the calculations represented in the DEIS could be too low. When the highest measured in-situ permeability of 2×10^{-4} cm/sec is used to determine average linear velocity, the range becomes 22-172 feet per year (26).

Response

The value mentioned is not representative of natural materials but represents an engineered cover. The values used for the calculation were determined by slug tests within the zone of saturation. Therefore, the range presented in the DEIS is appropriate.

40. Comment

The infiltration calculations on page F-193 (DEIS) do not appear to represent a worst-case scenario. The maximum flux rate from page F-190 would be about 5.2 ft. per year, based on the highest measured in-situ permeability of 2×10^{-4}cm/sec, as shown on Table F.4.4. This in turn yields a Q of 1.37×10^{5} ft^3/year. When the area is measured from the top of the Cheney Reservoir site up to Whiting's Ditch, as illustrated on Figure F.4.7 (p. F-192), the value for this parameter becomes 5.8×10^{6} ft^2 (2200 ft x 2640 ft). The quotient of this new flux rate divided by the adjusted area then becomes 2.3×10^{2} ft/yr, or an infiltration rate of 0.28 inch per year. This represents a difference of two orders of magnitude from the value stated on this page of the DEIS (26).

Response

See response 20 above.

41. Comment

It may not be valid to conclude that discharge occurs far from the site or is neglible due to evapotransportation. Because there is a potential for contaminant migration after permanent closure of any impoundment, the local hydrological regime should be further defined to the extent of knowing where and how discharge occurs. This information might prove useful in the design of the post-closure monitoring plan (26).

Response

An additional well installation program is planned with one to five wells to determine the extent of saturation and flow hydraulics in the shallow perched system between the Cheney Reservoir site and Indian Creek. This program should be completed during the fall of 1986. The results of the study will be used to refine the present design for water resource protection. Results and analyses will be presented in the final design.

42. Comment

It seems probable that the high total organic carbon (Cheney Reservoir site) is a residual effect of the drilling fluid. The gradient of 0.25 does not support a stagnant water table scenario (26).

Response

Ground-water flux is a function of both hydraulic gradient and hydraulic conductivity. Calculated flow rates at wells 508 and 701 are 0.13 ft/yr and 0.26 ft/yr, respectively. The high total organic carbon (TOC) observed in these two wells probably is a residual effect of the drilling fluid. However, because the TOC persisted after purging the wells, the idea that a very small ground-water flux may, at least in part, contribute to the persistently high TOC is conceivable. The second paragraph of Section F.4.1.6 of this FEIS has been revised to clarify this issue.

43. Comment

The second and fourth analyses listed on Table F.4.6 appear to have typographical errors in the reported values for pH (26).

Response

Correct. The incorrect values for pH shown on Table F.4.6 of the DEIS (70.2 and 60.2 standard units) (now Table 4.7 of this FEIS) have been changed to their correct values of 7.2 and 6.2 standard units, respectively.

44. Comment

The particular method for determining infiltration rates appears to be oversimplified (Section F.3.3.2). This application of the equation for wetting front advance has modeled precipitation by using 41 equally sized, low-magnitude precipitation events occurring over a one-year period. The natural variability that occurs between different rainfall events is not represented in these calculations. Larger precipitation events will influence infiltration, and have not been considered in the model (26).

Response

See Comment 20 above.

45. Comment

Since the 10 pCi/l value for natural uranium is not an EPA Interim Standard, it should not be included in the parameter list. If shown on Table 4.3, present as a footnote. Appropriate state standards for uranium also should be presented in such a footnote (27).

Response

Uranium has been deleted from Table 4.3.

46. Comment

Section E.2.1.2, Stratigraphy, page E-13; Section F.3.1.5, Saturated Zone Hydraulics, page F-52; and Section F.3.1.3, Stratigraphy, page F-45. The description of the stratigraphy of the Mancos Shale is very limited considering that the Mancos is the strata underlying the alluvium at the Grand Junction, the Cheney Reservoir, and the Two Road sites. The Mancos is the hydrostratigraphic unit of most concern and should therefore be more fully characterized in the text. It is necessary to characterize such strata in the vicinity of the sites to more fully understand such phenomena as the artesian zones (28).

Response

The Mancos Shale underlies the entire Grand Valley and forms the Book Cliffs and the base of Grand Mesa. This formation lies conformably on the Dakota Sandstone and consists of a thick sequence of gray, fissile shale with several thin (less than two to three feet) sandstone beds. A given sandstone bed can have considerable variation in porosity and permeability, as well as in thickness. The sands at the base of the Mancos Shale are transitional with the Dakota and could be interpreted to be either formation. Sands within the Mancos Shale in the vicinity of the Grand Junction site should not be considered as aquifers since they tend to be thin and discontinuous. In addition, the vertical permeability of the Mancos Shale is low and its thickness is so great that vertical migration of fluids into overlying and underlying units is very unlikely.

This information should be added to Section E.2.1.2 of the DEIS (see the Errata Sheet, Section 6.25). In addition, Section F.3.1.5 of this FEIS has been modified to include an analysis of structural control of ground-water levels.

47. Comment

Presently, there is an active irrigation operation upgradient of the proposed Cheney Reservoir site. Further information is needed to properly address the impact of irrigation recharge upon the local ground-water regime at the proposed Cheney Reservoir site (28).

Response

The stream flow along Whiting's Ditch was measured in July, 1986, upstream of the site and about one-third of the way downstream of the site. Measurements further downstream could not be made because a second diversion divided the stream into small flow rates that could not be measured. The purpose of these measurements was to determine the rate of seepage into the shallow ground water toward the site. Additional measurements will be made reported in the final design.

Table F.4.6 of Section F.4.1.5 has been added to report this information.

6.10 AIR QUALITY

Commentors focused on two issues: modeling results and a request for detailed mitigation measures.

1. Comment

The Friends of the Earth and Sierra Club consider the temporary air-quality impacts to be one of the most negative environmental impacts associated with the proposed removal of the tailings. The projected air emissions are totally unacceptable even for a conservative, worst-case analysis. Since the Grand Valley currently violates Federal air quality standards for particulates and constitutes a nonattainment area, as noted in the DEIS, any additional major particulate source is a significant problem. In addition, the effects of air emissions on the nonattainment area and on the Category 1 designation (similar to PSD Class 1) for the Colorado National Monument have not been fully addressed (22).

Response

The long-term site-related air emissions would be reduced from existing levels due to planned reclamation activities on the site. The short-term effects of the project on the Grand Valley nonattainment area, although of concern, would be quite localized as the impacts of project-generated fugitive dust decrease rapidly with distance. Impacts near the tailings site decrease to about 60 percent of the maximum values (Table 5.6) at a distance of one kilometer. Thus, impacts at the Colorado National Monument would be insignificant due to its distance from the mill site.

2. Comment

Impacts from air-quality deterioration on local residents are not fully addressed (22).

Response

As noted in response 1 above, impacts associated with fugitive dust are fairly localized due to a rapid decrease in concentration with distance. However, under the conservative assumptions utilized in this analysis, residents in the immediate vicinity of the tailings site would be subjected to particulate concentrations in excess of Federal and State ambient air quality standards. The Colorado Air Pollution Control District (APCD) will not issue an Emissions Permit if a (modeled) violation is predicted (see response 4 of Section 6.20). Therefore, additional refinements to the analysis to make it more realistic will be incorporated into the Emission Permit Application that will be prepared by the DOE prior to remedial action. If concentrations in excess of ambient air quality standards are still predicted, then additional control measures would be required by APCD to reduce standards violations.

3. Comment

Borrow pit-related emissions are dismissed as unimportant and therefore excluded. Historically, gravel mine operations in the area have been important sources of particulate emissions. Any borrow area, with associated traffic, being utilized as proposed at the 32 & C 1/2 area or Fruita area, could increase the anticipated air-quality impacts (22).

Response

Total borrow site emissions for the SOS alternative are approximately 10 percent of the emissions estimated to occur at the Grand Junction site. Accordingly, associated impacts at each borrow site would be considerably lower than at the Grand Junction site and clearly within all applicable air quality standards.

4. Comment

We request installation of air quality monitoring stations where needed, e.g., at the repository, since current stations are few and far between (22).

Response

Monitoring of radioactive particulates may occur on the sites during remedial action in support of the health and safety program. No other air quality parameters require measurement (unless so directed by APCD as part of a permit).

5. Comment

Air emissions for an all-rail alternative should be modelled (22).

Response

Since an all-rail option is not being examined as a project alternative, no such emissions will be modelled. Also see response 7 of Section 6.5.

6. Comment

The FEIS should include a discussion of a full range of air pollution control measures, including but not limited to: covered transfer stations with filtration systems; shutdown of operations during inversion period; and utilization of "low-as-reasonably-achievable" technology (10, 20, 22).

Response

The identification of additional specific control measures beyond those described in Section 5.20.1 will depend on emissions and modeling analyses performed in support of the Air Pollutant Emissions Permit application. The Colorado APCD will issue this permit.

7. Comment

The FEIS should quantify air emissions reduction based on longer timeframe for construction phase, e.g., four years vis-a-vis three years (22).

Response

As noted by the commentor, all information used in the air quality impact analysis was based on an equipment utilization schedule assuming a three-year timeframe. Although a detailed equipment utilization schedule for a four-year construction schedule has not been developed, it is estimated that total emissions associated with a longer schedule would be comparable to the current estimates. However, peak emissions would decrease as a result of lower equipment activity levels. The four-year schedule and its effects on air emissions will be given a more detailed analysis prior to final permitting efforts if such a schedule is chosen.

8. Comment

The Grand Valley is a nonattainment area for suspended particulates. The impacts of this project on other activities in the community, because of air quality standard violations, have not been considered. Further, the potential effects on residents near the mill site, haul routes or near repository sites have not been fully discussed.

Serious deficiencies exist within the DEIS concerning air quality impact assumptions. Calculated impacts from any of the transport alternatives seem irrational and far exceed any comparable estimates. Specifically, particulate emissions from the transport alternatives are between 4.5 and 6.5 times the total area source estimates modelled for the Grand Valley (PEDCO, 1978). The possibility of 1266 tons of uncontrolled mill tailings emitted from the Grand Junction site is incomprehensible and must be invalid. In addition, air pollution control measures, practices, and equipment have been superficially treated and must be addressed in adequate depth before serious consideration can be given to modelled predictions or emission estimates (20).

Response

Potential impacts to the nonattainment area and to residents near project facilities are discussed in response 1.

The emission estimates presented in the EIS are based on emission factors developed by the EPA and the Colorado APCD. Due to the lack of precise information concerning a number of factors (especially site-specific meteorology), a highly conservative analysis was performed. Modeled emissions were based on peak-month equipment activities. Emissions and associated impacts occurring during other months would be less. The emission level of 1266 tons of uncontrolled particulates is very consistent with EPA's composite emission factor of 1.2 tons per acre per month.

As noted in other reponses in this section, as part of the permitting process the APCD may require additional modeling to refine these estimates.

9. Comment

Should the FEIS retain Cheney Reservoir as the preferred alternative, we request that more analysis be included on greater efforts to mitigate air-quality impacts to residents at Kannah Creek, Whitewater, and neighborhoods along the hauling route (22).

Response

Prior to project implementation and as discussed above, DOE will be required to obtain an emissions permit from the APCD. Additional air quality dispersion modeling may be performed for the permit application. Any predicted (modeled) violations would have to be mitigated under APCD rules. Detailed air pollution control measures beyond those of Section 5.20.1 would be specified at that time.

10. Comment

Alternative 3 would move the tailings east on D Road to 30 Road, thence south to U.S. 50 and onto the Cheney Reservoir site. This will mean 209 truck trips daily on this route (D Road). At no place did I run across any statement that the trucks hauling tailings would be covered with a physical barrier to prevent particulates from blowing out along the proposed transportation route. Something of this nature needs to be spelled out in the FEIS (23).

Response

Section 5.20.1 specifies that all haul trucks and/or train cars would be covered to prevent dispersion of tailings during relocation.

11. Comment

Total enclosure of all loading and unloading operations (with negative air pressure practiced along with HEPA filtration) should be addressed (20).

Response

At the present time, no effective means have been identified to enclose truck loading operations. Frequent water applications are still viewed as the most feasible means of controlling dust emissions. The mitigation section (5.20.1) provides for the use of a covered loading and unloading structure for the rail cars for the train and truck transportation options. It should be noted that the final design of all control measures will not be specified until the final permitting phase.

12. Comment

Pages 147-148, Table 5.5. The time values on this table are not defined. Specify day, week, month, etc. (25).

Response

These values represent the total tons of uncontrolled air pollutants emitted over the life of the project associated with each alternative. Table 5.5 has been revised.

13. Comment

The data presented in Table 5.5 generate a number of questions requiring clarification.

- Do the estimated emissions for the various alternatives include both contaminated and uncontaminated materials? If total, what is the estimated percentage of contaminated material in each case?

- Without reading the text (page 146 - last paragraph) one might interpret these data to be losses of contaminated material during transport instead of road dust dispersed by trucks. Perhaps a footnote should be added to emphasize this point.

- Data should be included to show the estimated losses of contaminated materials during transport. Similarly, the specific control measures (water spraying material after loading, covering in trucks or trains, etc.) implemented to minimize such losses should be discussed in detail in the text.

Overall, experience and data gained from the relocation of the Vitro tailings pile in Salt Lake City might be useful to increasing the accuracy and validity of the estimates presented in Table 5.5 (27).

Response

The emission estimates presented in the air quality analysis represent total suspended particulates (both contaminated and uncontaminated). While contaminated materials would account for a large portion of these particulate emissions, a breakdown of contaminated vs. uncontaminated material would not be meaningful with respect to air quality standards since ambient air quality standards for particulates do not incorporate radiological effects. The standards were designed to account solely for adverse health effects associated with non-radiological particulates. A complete discussion of potential health effects associated with radiological impacts is presented in Section 5.1.

Further, the text in question states, "the dispersal of road dust by trucks." However, Table 5.5 has been footnoted to emphasize this distinction.

The specific loss of contaminated material associated with transport would be quite small due to planned control measures (see response 11). The specific control measures incorporated into the final design will be identified during permitting activities.

6.11 HEALTH EFFECTS AND RADIATION

Most commentors focused on health effects issues such as individual effects and methods of calculation. Other commentors were concerned with contamination from remedial action activities.

1. Comment

We probably have a high rate of cancer in Mesa County, but us old timers have been here forever and we don't die of cancer because of these uranium tailings (2).

Response

No response required.

2. Comment

Locating the mill tailings at the Cheney Reservoir site could pose health hazards for those living along Kannah Creek (18).

Response

The short- and long-term (i.e., 1000 years) excess health effects from disposal at the Cheney Reservoir site are shown in Table 1.1 and are discussed in Sections 5.1.4 and I.5.3 (DEIS). The estimated health effects are 10 times greater for disposal at the Grand Junction site than for disposal at the Two Road site or Cheney Reservoir site.

3. Comment

The number of public health and remedial action worker health effects has been grossly overestimated in Alternative 1 (6).

Response

The DOE agrees that the number of health effects probably have been overestimated. This is because conservative assumptions concerning health risks have been made due to the uncertainty in the parameters used to estimate these risks.

4. Comment

Alternative 6 - Two Road site by train and truck would be safest for all, though more costly to accomplish. When people's lives are at stake, cost should be considered acceptable rather than an excuse to pick the cheapest method. Your death projections mean nothing, because the government always denies its action harmed anyone or caused deaths to the public (23).

Response

The DOE uses health effects analytical techniques acceptable to the scientific community. Estimated excess health effects for disposal at Grand Junction would be greatest; estimated excess health effects for disposal at the Cheney Reservoir and Two Road sites would be lowest and similar.

5. Comment

Stabilization at the Grand Junction site is best because for the relocation options the distance to transport tailings poses a health threat to more people, crops, and livestock along the way, and possible accidents or spills (11).

Response

Although it is true that the radiological hazards are greater, although insignificant, for relocation, there would be about ten times as many excess cancer fatalities if the tailings were stabilized at the Grand Junction site instead of at the Cheney Reservoir or Two Road sites.

The potential for accidents and spills is small as indicated in Section I.4.5. Also see responses 7 of Section 6.5 and 6 of Section 6.6.

6. Comment

On Page 140 it says - "persons along transportation route may be exposed to gamma radiation from passing vehicles hauling tailings." Besides this, we could expect to inhale windblown particulates from passing trucks (there are 8.3 mph winds in the valley according to DOE data and the U.S. Weather Service). Those of us who grow crops along the route may ingest it that way too (23)?

Response

As noted in Section I.4.2 of the DEIS "The health impacts caused by particulate releases are shown to be small when compared to . . . radon daughter inhalation" (based upon construction activity at the mill or disposal site). Since trucks will be covered during transport and particulate release will be far less than at the mill or disposal site, estimated health effects to an individual along the haul routes during remedial action will be negligible.

7. Comment

Your health statistics projections on cancer to the body varies from 0.058 to 0.512 for Alternative 3 for persons along the transportation route. How do you know? Are you familiar with each individual that lives along this route to know their individual risk? Despite many years of gained knowledge on radioactivity, the government still does not know or makes guesses (23).

Response

No attempt is made in the EIS to assign individual cancer risks because, as the commentor notes, risks cannot be assigned to an individual. Rather, given a population, sufficient data are available to estimate a collective dose and then compute the risk to the entire population, all other factors considered equal.

The DOE agrees with the commentor that there are many uncertainties in the prediction of health effects. Accordingly, conservative assumptions are used in predictions to overestimate impacts.

8. Comment

Impacts from air quality deterioration on local residents are not fully addressed. Projected deaths and other impacts are based on the general population, and do not consider the number of residents affected, or the degree to which they would be affected, depending on their proximity to the mill site, proposed haul routes, and the repository site (22).

Response

Projected deaths and other impacts do in fact, consider the number of residents affected. The degree to which an individual is affected is impossible to estimate. Given a large population, however, the excess number of cancer deaths can be estimated. For example, the larger number of health effects associated with the SOS alternate is a direct reflection of the larger population density in the vicinity of the Grand Junction site. The MILDOS code, used to estimate the health effects, provides an estimation of dose equivalents received at increasing distances from a site where radioactive material is released. It was not felt that this level of detail was appropriate for the EIS. All MILDOS output information is available at the UMTRA Project Office in Albuquerque, New Mexico, and is available on request.

9. Comment

In order to do an adequate treatment of one of the most important environmental impacts of the project, the FEIS must include analyses for the effects of additional radon and particulates on local residents near the mill site, along the haul routes, and the repository site (22).

Response

These analyses in sufficient detail, particularly given the magnitude of the estimated effect, have been performed and are reported in detail in Appendix I, Radiation Health Effects, of the DEIS.

10. Comment

Alternative #4 - train and trucking to the Cheney Reservoir site (if chosen) would cost more but endanger far less of the population even though it will cost more (23).

Response

Agreed. See Table 1.1 for a comparison of health effects among alternatives.

11. Comment

Exposures would <u>increase</u> under the no action alternative due to the continual spread of contamination (26).

Response

The DOE agrees, as noted in Sections 1.4 and 3.4.1.

12. Comment

Table 1.1 and Section 5.1.6 don't consider or include remedial action worker health from private tailings removals at vicinity properties, as well as continued exposure for workers during future removals. These removals will continue well into the future and health effects should be estimated (26).

Response

The DOE agrees that these health effects will occur and continue as noted by the commentor. Since these effects would be the same for any action alternative (although much lower than vicinity property effects estimated in the DEIS because of the low number of private clean-ups and residual properties following remedial action), the reader could utilize the procedures and information in Appendix I, Radiation Health Effects, to estimate such effects. Such estimates, however, are not necessary because of lack of variation among the action alternatives for the FEIS.

13. Comment

The continued exposure due to the spread of contamination (no action) is not addressed in the Public Health column of Table 1.1 (26).

Response

It is impossible to quantify the amount of contamination spread by future misuse of the tailings; therefore, potential health impacts cannot be quantified. Suffice to say that given continued misuse (unlikely), and spread by erosion (minimized by limited cover), health effects, given all other factors constant, would increase slightly over those estimated by Alternative 1 - no action.

14. Comment

How was the estimate of 1010 cancer deaths in 1000 years from the radiation released at vicinity properties (under the no-action alternative) derived? Were increased levels of exposure due to the continual spread of contamination taken into account in this projection? Private tailings removals would also continue at vicinity properties, which would result in additional exposures to workers (26).

Response

The estimate of 1010 cancer deaths was made by assuming that 12,748 persons were exposed to a gamma exposure rate of 28.3 μR/hr for 8760 hours per year and that 4152 persons were exposed to 0.013 working level for 6570 hours per year. These estimates do not include the exposure due to continual spread of contamination or private tailings removals. These impacts are impossible to estimate because unauthorized use of tailings leading to the spread of contamination and the numbers of workers or the time involved in private tailings removals are impossible to estimate.

Also see response to comments 12 and 13.

15. Comment

Page 140, paragraph 7. The dose equivalent commitment from radon daughter exposures is not consistent with Appendix I, p. I-50 (26).

Response

The dose equivalent reported (Section 5.1.4) is a typographical error and has been revised to 15.8 rem/yr.

16. Comment

Consistent with Section 1.4, estimates of excess population dose equivalent commitments should be presented for four-year or longer construction periods (see Tables 5.1 and 5.2) (26).

Response

The DOE disagrees. The health impacts presented in Tables 5.1 and 5.2 reflect the impacts from the time remedial action begins until the tailings have been covered. These time periods are 2.3 years for alternative 2 and 2.7 years for alternatives 3-6.

17. Comment

Unless a subcontractor can be forced to place special shielding on mobile equipment, a one-inch iron equivalent shielding will probably not be provided by the vehicle. The gamma radiation estimates should be re-examined on the basis of real equipment (26).

Response

Considering that the Grand Junction tailings are covered, albeit ineffectively, the estimate of 1450 μR/hr is conservatively high, and the vehicles will provide additional shielding. Thus, the estimate of 145 μR/hr provides a reasonable basis for estimated effects for comparison among remedial action alternatives.

18. Comment

Page I-32, paragraph 5, 2nd sentence - "dose equivalent to the lung of 31 mrem/yr." (26).

Response

Agreed. This sentence should state 31 mrem/yr rather than 31 rem/yr. See the Errata Sheet, Section 6.25.

19. Comment

Page I-50, paragraph 5, 1st sentence - "The radon concentration may be estimated to be. . ." (26).

Response

Agreed. This sentence should state "The radon concentration. . ." rather than the radon daughter exposure. See the Errata Sheet, Section 6.25.

20. Comment

The value estimates for the dose equivalent commitment from radon daughter exposures for the "maximally exposed resident" - 9.1 mrem/yr - appears to be too low an estimate. For a resident living full-time at this location, shouldn't the weighted radon daughter conversion factor of 4.38×10^{-4} rem/yr (pCi/l) have been used for indoor conditions? The radon concentration value of 4.68 pCi/l appears to be too low an estimate, e.g., when compared to data presented in Section I.3.2.1. Documented indoor RDC data (on file at the Grand Junction Office of the Colorado Department of Health) for structures nearest the pile should also be investigated. Reasonably conservative estimates suggest that the 9.1 rem/yr value quoted could be a factor of approximately two or three too low (26).

Response

The radon concentration of 4.68 pCi/l is calculated to represent long-term average conditions. The measured concentration of 6.7 pCi/l was taken over a 24-hour period, and probably would not represent long-term average conditions.

The dose conversion factor of 2.21 rem/hr (pCi/l) is incorrect; the dose conversion factor for the general population of 3.86×10^{-4} rem/hr should have been used.

In the DEIS, the factor of 4.38×10^{-4} rem/hr should be replaced with 3.86×10^{-4} rem/hr per (pCi/l) (pages I-7, I-32, I-38, I-41) in all calculations; on page I-50, Section I.5.6, 2.21×10^{-4} rem/hr should also be replaced with the new factor; on page I-32, 2.75×10^{4} person-rem should be replaced with 2.42×10^{4}; and on pages I-38, I-41, and I-47, 1.44×10^{4} person-rem should be replaced with 1.27×10^{4} person-rem. (See the Errata Sheet, Section 6.25.) In the FEIS, Section 5.1.4 (Table 5.1) has been revised accordingly.

21. Comment

General comment - It is difficult to pull together the excess cancer/death risks from the report (26).

Response

Table 1.1 summarizes the excess health effects.

22. Comment

Page I-50, paragraph 6. Regarding the maximumally exposed resident, it is assumed that no such scenario would be allowed - i.e., would not be permitted by the authorities to take place (26)!

Response

Agreed. This worst-case analysis was conducted only for comparative purposes.

23. Comment

In Section 4.8, Radiation, it is stated that "for purposes of this EIS, the terms roentgen and rem may be considered equivalent." To avoid confusion by the general reader, this statement may be clarified by stating that the rem and roentgen are equivalent for gamma rays only (22).

Response

Agreed. Section 4.8 has been revised.

24. Comment

In Section 4.8, the DOE makes some general statements regarding radiation sources which people are normally exposed to and the resultant dose equivalents. Although these general statements are well known, it may be appropriate to reference their source (28).

Response

Agreed. Section 4.8 has been revised.

25. Comment

In Section 4.8.1, it may be instructive to compare the radioactive air particulate concentrations with unrestrictive area MPC standards. For example, Th-230 concentration is greater than 100 times the unrestrictive area MPC.

Response

The DOE disagrees. The airborne particulate concentrations mentioned were only based on short-term (3.2-hour) measurements. MPC limits are to be used as a yearly average, and thus it would be somewhat misleading to compare short-term results with MPC limits. Also, the applicable limits would be based on the solubility of the particulates which is not available at this time (ORNL, 1980).

26. Comment

Section I.2.1, Health Effects of Exposure to Radon Daughters, page I-7, last paragraph, first sentence: The units rem/hr (pCi/l) should be rem/hr/(pCi/l) (28).

Response

The units as expressed are identical to those suggested. We have chosen this form since it results in less confusion.

27. Comment

Section I.3.1, Existing Characteristics at the Grand Junction site (Physical characteristics), last paragraph: A tailings emanation coefficient of 0.20 was used in Appendix I. This value was obtained from a 1979 draft NRC publication. Chapter 3 of the NRC's, "Standard Review Plan for UMTRCA Title I Mill Tailings Remedial Action Plans, U.S. Nuclear Regulatory Commission, Division of Waste Management, October, 1985," states that a reasonably conservative emanation coefficient of 0.35 is considered acceptable by the NRC staff. Therefore, until such time as measured values are available, a conservative value of 0.35 is recommended for use in the EIS (28).

Response

Actual measured values for the emanating fraction became available subsequent to publishing the draft EIS. The mean value based on 35 measurements distributed evenly throughout the pile was 0.41 with a standard error of 0.01. This new value will be used in all radon barrier cover design calculations.

We agree that calculations based on a 0.2 emanating fraction are not conservative. Fortunately, the radon source term was derived using the very conservative radon flux to Ra-226 concentration ratio of 1 pCi/m^2s Rn-222 for each pCi/g Ra-226 in the tailings., Only in the calculations related to additional radon release due to movement of tailings is the emanating fraction used. This is a very insignificant fraction of the total radon released (see page I-19). Since the error from this improperly chosen parameter is small, we cannot justify the significant effort necessary to correct the health effects estimate.

28. Comment

Section I.3.1, Existing Characteristics at the Grand Junction Site (Radon in air), page I-11: Explain why a windspeed of two m/s was used as input to the Gaussian sector average dispersion model when the DEIS on page D-3 states the average wind speed to be 8.7 mph (3.9 m/s) (28).

Response

The Gaussian sector model is an average dispersion model. The addition of velocity vectors in the sector of interest, considering their frequency, was made and the radon concentrations derived accordingly. This was done for estimating the health effects within one kilometer of the pile. Section I.5.1 provides further discussion.

29. Comment

Section I.5.4, Health Effects in Perspective, page I-62: This section incorrectly states the estimates of the collective dose equivalents are presented in Table I.5.4. The correct reference is Table 5.4 in Volume I (28).

Response

We agree. See the Errata Sheet, Section 6.25.

6.12 SOCIOECONOMICS

Most of the comments received were from the City of Grand Junction. The City provided more recent information than was available at the time of publication for the DEIS.

1. Comment

Your DEIS has been reviewed with consideration for the area of responsiblity assigned to the U.S. Department of Housing and Urban Development. This review considered the proposal's impact on urbanized areas. Subject to the mitigative measures outlined in Section 5.20 of the DEIS, we find this document adequate for our purposes (14).

Response

No response required.

2. Comment

(4.12.5 Government Structure, p. 118). Grand Junction has a seven-member city council (24) (See the Errata Sheet, Section 6.25).

Response

Agreed. Section 4.12.5 has been revised; section K.1.5.1 of the DEIS should be modified (See the Errata Sheet, Section 6.25).

3. Comment

(4.12.6 Community Services, Water Supplies, Waste-Water, and Public Utilities, p. 119). The city of Grand Junction supplies water to approximately 19,000 people; the service area is smaller than the city.

The newly completed waste-water facility has a capacity of 12.5 million gallons per day, may be expanded to 25.0 million gallons per day, and is currently operating well below capacity (24).

Response

Agreed. Section 4.12.6 has been revised to reflect this new information from the city of Grand Junction. Section K.1.6.3 of the DEIS should also be modified (See the Errata Sheet, Section 6.25).

4. Comment

(4.12.4 Housing, p. 117). Technical Report #1. Vacancy Survey has been included for your information (24).

Response

Thank you for the information. The DOE has reviewed this information (housing vacancy report) and notes that it applies to all housing types whereas the vacancy rates in the DEIS were for rental housing only.

5. Comment

Page 8, Orchard Mesa Middle School (enrollment 619) is across the Colorado River and 1500 feet from the current tailings site (25).

Response

No response is required.

6. Comment

Page 117, paragraph 5, the drastic reduction in energy industry activities circa 1981 has produced significant impacts on housing vacancy rates and values that are not described here (26).

Response

At the time data were collected on housing, vacancy rates more recent than those given in the 1980 census were not available. The city of Grand Junction's Planning Department has since conducted a survey of vacancies within the city limits. Section 4.12.4 has been revised to include the survey results as appropriate. No survey has yet been conducted of vacancy rates in the entire Mesa County.

6.13 NOISE

Comments were received principally from the State of Colorado. The state questioned the modeling analyses and the lack of specific mitigations.

1. Comment

The document does not address transportation noise impacts. It is difficult to imagine that an estimated 26 to 74 trucks passing by per hour along various roads (e.g., D road) wouldn't be adverse to noise sensitive receptors (9, 26).

Response

As noted in Table 5.10 of the DEIS and in Section 5.8, impacts along transportation segments have been estimated. In addition, the incremental increase in noise from truck pass-bys has been added to Table 5.10 of the FEIS. The commentor is correct in that noise impacts to receptors along D road would be substantial for the SOS alternative; cumulative noise impacts would be much less for relocation to Cheney Reservoir by truck.

2. Comment

Presentation of the noise impact data read well to the uninformed (26).

Response

No response is required.

3. Comment

The environmental noise survey data including presentation of summary of results did not address the distribution of wind direction and speed, terrain, vegetative cover, deflective surfaces, valley, induced upslope and downslope air flows. Each of these elements could increase or decrease the noise impacted areas (26).

Response

The commentor is correct. For purposes of this EIS, however, the conservative assumptions used in the predictive model were more than adequate to generate a realistically upper noise limit without the need to account for the described influences. Instead, Section 5.8 has been revised to acknowledge the influence of these factors. The DOE is aware that winds (air flows) are characterized by gradients of increasing speed with elevation above the ground, and that these gradients have the effect of bending sound waves upward away from the ground, upwind of the sound source; downwind, sound is diffracted toward the ground. Neither of these phenomena would result in sound levels greater than predicted without considering winds; they would result in lower sound levels than otherwise predicted. Turbulence causes further reduction. Vegetative cover and other features add to small-scale surface roughness to absorb sound effectively and further reduce sound propagation near the ground surface. With respect to the potential for sound reflection, none of the construction sites where sensitive receptors would be subjected to daytime sound levels conservatively estimated (i.e., without consideration of air absorption, wind, surface absorption, etc.) at above 55 decibels (the Grand Junction tailings site, the 32 and C 1/2 borrow site, and the Fruita borrow site) have major nearby or on-site topographic features or other structures that would increase the sound levels at sensitive receptors because of sound reflection.

4. Comment

The preferred alternative from the standpoint of the least noise impact to the community is the Two Road alternative, transporting the material by rail (26).

Response

As discussed in Section 5.8.5 of the EIS, the rail transport alternatives would result in much lower noise emissions in Grand Junction and in the affected corridors since the trains would only travel these corridors twice a day. Disposal at the Two Road site with train and truck transport would probably have the lowest overall noise impact among the alternatives because of the remoteness of the Two Road site.

5. Comment

The noise prediction model (Kessler et al., 1978) was used to estimate the maximum A-weighted equivalent sound level emitted from the tailings, disposal, and borrow sites. The document states that this noise model is conservative due to a lack of data input for attenuation of air absorption, berms, or foliage and the predicted results are probably higher than would be realized. I disagree.

The model clusters all equipment into a group and treats it as a single event source. It predicts an average of all components. The model assumes all activity is conducted at the center of the site and not at the perimeter boundary. Also, it is assumed that all earth moving and excavation machinery is in good mechanical working condition and that the mufflers are functioning properly as designed. This is hopeful but doubtful. The model predicts equivalent sound levels which are averages where single event sounds are much higher.

This noise prediction model is a good tool for general predictions/ assumptions, but as with most models it has its limitations (26).

Response

The DOE agrees that the model has limitations. The model does not discretely portray the impacts of loud, single-event sounds, nor does it consider the spatial pattern of equipment activities through time at the sites. The only large site where sensitive receptors are relatively close (and where the limitations of the model could be important) is the Grand Junction tailings site. Several residences are located 200 to 600 feet from the west boundary of the site, and a middle school and additional residences are located 600 to 1500 feet from the southern boundary of the site. These receptors could be subjected to outdoor noise levels above those described in the EIS at various times when equipment activities are concentrated closely to the nearest boundaries. However, at other times noise levels would be lower than estimated in the EIS when equipment activities are concentrated at distances greater than the distance to the center of the site. In addition, single event sound levels would sometimes be higher than the predicted maximum equivalent sound levels. It should be noted that the preferred alternative would involve predicted maximum equivalent sound levels of three to four decibels lower at the Grand Junction tailings site than under the SOS alternative. It is further emphasized that peak equipment utilization levels were assumed in the EIS; lower equipment utilization levels and the effects of attenuation (see response 3 above) would substantially reduce project noise levels at sensitive receptors.

6. Comment

The document clearly states that during all of the proposed alternatives (except the no action alternative), daytime noise levels for residents living near the pile would be elevated by more than 10 decibels above existing ambient levels. Residences near the Cheney Reservoir and Two Road sites would realize an increase of about 15 to 20 decibels, while near the borrow sites the ambient level will be elevated by 20 decibels.

Doubling of sound levels occurs with an increase of each 3-decibel elevation. Sounds are perceived by people to be twice as loud when the level is increased by at least 10 decibels. These levels produce community reactions such as annoyance, activity interference, social and speech interference, disruption of the educational process if near a school, and possibly sleep interference. For instance, speech interference occurs approximately at 65 decibels while sleep interference can occur at any sound level. The important point here is that noise is subjective. It is difficult to make a statement that the noise is short term and minor annoyances will result to neighbors. Noise is a stressor. Reaction is more complex since the quality of life factors are typically ignored during noise assessments including the age distribution of the population affected by these projects. Tolerance levels are substantially different from the young to the elderly. Mitigative measures must be included to attenuate the noise emissions from the construction-excavation process and transportation corridors. These simple measures include sound barriers, fences and/or berms, time of day of operation, properly functioning mufflers, etc. (26).

Response

It must be emphasized that noise impacts would be during daytime hours. The maximum outdoor noise impacts discussed in the EIS represent a reasonable conservative analysis, assuming peak levels of equipment utilization and without considering outdoor attenuating factors. Actual average impact levels should be substantially less. Impacts to indoor receptors would be further reduced by roughly 12 to 25 decibels (EPA, 1974, as cited in Section 4.10 of the EIS). With respect to residences near the potential borrow sites, or near the Cheney Reservoir or Two Road sites, only residences near the 32 and C 1/2 borrow site (up to 63 decibels) and the Fruita borrow site (up to 66 decibels) would be subjected to outdoor noise levels greater than 55 decibels; under the preferred alternative, neither of these borrow sites would be used. It is agreed that in some receptor locations, especially where daytime outdoor noise levels could exceed 65 decibels, daytime annoyance and accompanying stress could result. Mitigation of noise impacts is discussed in response 8 below.

7. Comment

Table 5.11, "Impacts on average daily traffic volumes by remedial action alternative," clearly identifies the one-way truck trips per day. The true impact is the realization of round trips meaning twice the number of truck trips per day.

Therefore, the truck transportation noise impact section needs to be expanded to present the actual noise impacts from this major activity (26).

Response

Table 5.10 does account for truck trips in both directions where round trips are involved.

8. Comment

No mitigative measures were identified for the abatement of excessive noise. The following mitigative measures would assist in attenuating excessive noise to the impacted community.

- o Conform to Colorado Noise Abatement Statutes time periods for maximum permissible noise levels for sensitive noise receptor land uses.
- o Construct properly designed noise fence, barrier, or berm adjacent to noise sensitive receptors. This includes proper placement from source to receiver, height of barrier, and proper material selection.
- o The community should adopt a comprehensive noise ordinance to include an enforcement mechanism for adequate protection to the public.
- o All construction equipment that requires a muffler should have properly functioning, quiet-design mufflers.
- o Require a preventative truck/equipment maintenance program to be implemented.
- o Require quiet-design functional mufflers on all equipment, especially haul trucks.
- o Require tailgates and any other metal-metal source be firmly secured during transportation.
- o Restrict dynamic braking devices (jake brakes) within the city limits and near any noise sensitive receptors except for the aversion of imminent danger.
- o Require an ongoing road maintenance program to reduce secondary noise impacts from nonuniform road conditions, chuckholes, washboard effect.
- o Provide direct funding for road maintenance beyond pay road use taxes (26).

Response

Several of the suggested mitigations will be used. For example, DOE will abide by all applicable noise abatement permits, mufflers must function and be maintained, tailgates will be secured, and haul roads constructed specifically by the DOE will be maintained. Section 5.20.1 has been revised accordingly.

6.14 SCENIC QUALITY

Two comments regarding scenic resources were received; one regarding the impacts to the proposed Dominguez Canyon Reservoir and the other regarding the impacts analysis.

1. Comment

The location of the repository will affect scenic and recreational values, including the proposed Dominguez Canyon Reservoir (20).

Response

The Dominguez Reservoir was a proposed Bureau of Reclamation (BOR) project to store between 300,000 and 700,000 acre-feet (depending on which option was selected) of water on the Gunnison River. The earthen fill dam would have been located approximately two miles south of Whitewater and would have covered between 5000 and 8400 acres. A study conducted by BOR in April, 1984, did not recommend building the 393-to-688-million dollar project. In fact, conversations with BOR indicated that the reservoir would not be built in this century and that Congress has never appropriated funds.

Regardless, if the dam were built, the maximum water surface elevation would be 4880 feet. This would back water up Kannah Creek about a mile west of Highway 50. This would be over three miles from the proposed Cheney Reservoir disposal site. The main body of the reservoir would be over five miles from the diposal site. Thus, no scenic effects would be anticipated.

2. Comment

The visual impacts of a 35-feet-above-grade rock covered pile will probably be greater than is stated in the DEIS. Potential long-term impacts on scenic and cultural values/resources of these areas should be further described (26).

Response

The DOE disagrees. The scenic impacts have been discussed adequately given the remoteness of the Cheney Reservoir and Two Road disposal sites.

6.15 POPULATION

Seven commentors addressed a few issues: population growth, "remoteness," and employment.

1. Comment

Two Road is best. There's no population west of Eight Road and north of 6 & 50, except in the wintertime when the sheepmen come out there (2, 19). Kannah Creek has a substantial population for the area. I don't feel that it is really a remote area where the present location (i.e., Cheney Reservoir) is being proposed (1, 2, 4).

Response

Clearly, the population near Two Road is less than that of Cheney Reservoir; however, both sites are remote when compared to Grand Junction, Whitewater, or Mack. It should be noted that the DOE preference for the Cheney Reservoir site is based on consideration of a number of factors affecting the population in Grand Junction and Mesa County on the whole. Comparison of the alternatives was conducted with regard to radiation doses, land use, transportation, noise, air quality, employment, population, cost, and the like. On the whole, the impacts of the alternatives involving stabilization of the tailings away from Grand Junction are similar in magnitude; however, the Cheney Reservoir with truck transport alternative is the least expensive at $56 million.

2. Comment

The Cheney Reservoir area is likely to experience more long-term residential growth due to current county growth patterns, utility corridors, and the proximity of private lands than is the Two Road site which is buffered by a great deal of Federal land. Even assuming the initial respository meets EPA standards, there is more potential for long-term institutional problems with the Cheney Reservoir site, e.g., radon exposure to nearby residents, impacts on ground and surface water, and greater risk of vandalism and disturbance due to population. These issues should be more fully analyzed in the FEIS (20, 22).

Response

On the basis of population information presented in Sections 4.12.1 and K.1.1 of the DEIS, and land ownership patterns and use of Sections 4.9 and K.3 of the DEIS, it is not readily apparent (nor is it likely) that population growth patterns favor development of the Cheney Reservoir areas.

Due to the depressed economy throughout western Colorado, it is difficult to project growth patterns in outlying areas. While it is more likely that future growth would occur at Cheney Reservoir than at Two Road, it is speculative, while the present known costs favor relocation to the Cheney Reservoir site.

3. Comment

Our observation of local factors confirms the DEIS analysis that a repository at Cheney Reservoir would have significantly more impacts than a repository at Two Road due to proximity to population at Kannah Creek, farm/ranch operations, and recreation areas on the Gunnison River (22).

Response

The DOE disagrees. This EIS makes no assertion that disposal at the Cheney Reservoir site would involve significantly greater impacts than disposal at the Two Road site. On the contrary, the Summary of Impacts (Table 1.1) indicates a point-by-point similarity of the two sites with the exception of one item: cost.

4. Comment

(4.12.1, Population, p. 116). The Grand Junction planning department has been regularly tracking population trends for the urban area. The attached Data Sheet and Technical Report #3.1 more accurately reflect the true population of the area (24).

Response

Agreed. Section 4.12.1 has been revised to include these data as appropriate.

5. Comment

Any increase in employment can be absorbed by the local economy and infrastructure at the present time (20).

Response

Agreed. Section 1.4, Table 1.1 of the EIS notes that existing social services are adequate to accommodate anticipated increases in population. That 25 percent of direct project employment is expected to come from outside Mesa County reflects the need for specialized management and technical skills. The local work force is deemed sufficient to supply the remaining 75 percent of direct project employement as well as all indirect and induced employment.

6.16 FLORA AND FAUNA

Most of the comments of this section came from the U.S. Department of Interior (DOI). The DOI was particularly concerned wih impacts to riparian habitat, endangered/threatened species, and specific species information.

1. Comment

A primary concern with Alternatives 2-6 is the potential for loss of 40 acres of riparian habitat and its impact to riparian and aquatic flora and fauna. This impact may occur because of the need to remove contaminated vegetation and topsoil adjacent to the tailings pile. However, we have learned that a radiological survey was recently conducted in the project area and that only a small (about 1/4 acre) area may be contaminated in excess of the EPA standards. If this information is confirmed and included in the EIS, it is possible that loss or disturbance of riparian habitat could be insignificant. If so, it may only require limited revegetation of disturbed areas with native species to offset losses of wildlife values or other appropriate mitigations. We recommend that loss of riparian habitat be avoided where possible. Riparian habitat, which is relatively scarce in the project area, is probably the most diverse and important wildlife habitat in the State. In accordance with Fish and Wildlife Service (FWS) mitigation policy (Federal Register 46, No. 15, January 23, 1981), we have established that the riparian habitat in the project area is classified as Resource Category II. This means the FWS mitigation goal would be no net loss of in-kind habitat values. Unavoidable losses of riparian habitat in the project area would require in-kind replacement of habitat value (13, 25).

Response

A recent radiological survey of this riparian zone resulted in a substantial reduction in the area of contamination in the riparian zone down to an estimated 0.2 acre. Sections 4.7.3, 5.6.1, 5.6.2, 5.6.3, and Appendix G, Floodplain and Wetlands Assessment, of this FEIS have been altered to reflect this new information.

2. Comment

Although no primary impacts will occur at Cheney Reservoir, secondary impacts as a result of human disturbance during construction and increased access after construction may be significant and should be addressed in the EIS. This area is a valuable wetland area, particularly for waterfowl and shorebirds. Sandhill cranes utilize the reservoir during their migration and thus there is potential for whooping crane utilization also (25).

Response

It is acknowledged that Cheney Reservoir (a reservoir located about 1.5 miles southeast of the Cheney Reservoir site) provides habitat for shorebirds and waterfowl. In addition, it is assumed that sandhill cranes and possibly whooping cranes may stop off at this reservoir during migration. However, given its location relative to the disposal site and that the truck haul route will not pass by the reservoir, remedial action activites at the Cheney Reservoir site will not impact wildlife use of Cheney Reservoir.

Indirect impacts associated with dust, noise, and human activity also would not be expected to extend out more than 1500 to 2000 feet from the source of disturbance. Therefore, these indirect impacts also would have little or no impact on wildlife use of Cheney Reservoir.

The upgrading of the dirt road leading to the Cheney Reservoir disposal site may improve access. However, the magnitude of increased use is not expected to be of such a level to preclude or reduce wildlife use of Cheney Reservoir.

3. Comment

Page 93, paragraph 2. Pronghorned antelope are believed to use the Cheney Reservoir area for kidding. The impacts section underemphasizes the herds to be affected (25).

Response

It is agreed that the Cheney Reservoir site area probably is a kidding area for pronghorn antelope. Data regarding the number of pronghorn in the herd have been included in Section 4.7.3 of the FEIS. Specific mention of the loss of pronghorn habitat is included in Section 5.6.1.

4. Comment

Page 93, paragraph 3. Substitute the word "low" for the word "limited." No place has an unlimited diversity of biota (25).

Response

Agreed. Section 4.7.3 has been revised.

5. Comment

Page 94, paragraph 1. We question that sharp-tailed grouse occur and nest at this site. It is more likely that chukar partridge occur and nest at this site. Further investigation of the question of the sharp-tailed grouse is necessary. Use of the common name "marshhawk" should be replaced with "northern harriers." The name "meadow lark," however, should be one word with a modifier, "western meadowlark" (25).

Response

The EIS indicates that the sharp-tailed grouse nest near the Two Road site. This information came from direct field observations in support of the Glenwood-Dotsero salinity study (URS, 1983).

Section 4.7.3 has been modified to reflect the requested recommendations.

6. Comment

Page 95, paragraph 1. Some misconception is apparent in the communication with BLM (1985). Uinta Basin hookless cactus has a high chance of occurring on the Cheney Reservoir site. Occurrence would require that the Cheney Reservoir area and the transporation corridor be surveyed and cleared for the Uinta Basin hookless cactus prior to any surface disturbance. There are no populations of Uinta Basin hookless cactus in the Unaweep Canyon known by BLM (1985). Spineless hedgehog cactus is the species of Unaweep Canyon, although none have been reported to BLM from the western side of the Unaweep Canyon divide (25).

Response

The possible occurrence of the Uinta Basin hookless cactus was addressed in a Biological Assessment (DOE, 1983). Field surveys in which a BLM biologist participated indicated that this species does not occur at the Cheney Reservoir site. The FWS concurred with the finding of "no effect."

Section 4.7.4 has been revised to indicate that this cactus has not been reported from Unaweep Canyon.

7. Comment

Page 95, paragraph 2. The subspecific epithet should be spelled the same as the specific (Speyeria nokomis nokomis). The location of the borrow site in relation to the butterfly's habitat should be given (25).

Response

The spelling has been revised in Section 4.7.4. The specific location in Unaweep Canyon has not yet been determined. If the SOS alternative is ultimately chosen, the specific borrow site would be identified and the DOE would consult with all agencies having regulatory authority over such a site.

8. Comment

Page 95, paragraph 3. The Colorado squawfish does occur in the Colorado River at Grand Junction. By letter dated October 30, 1985, the Fish and Wildlife Service (FWS) provided Jacobs Engineering Group Inc., with Colorado squawfish data for this reach of the Colorado River. These data show that between 1982-1984, nine radio-tagged Colorado squawfish moved through the reach of Colorado River adjacent to the inactive uranium mill tailings. These data should be utilized for drawing conclusions made in the FEIS regarding the presence of Colorado squawfish in the project area (25).

Response

Agreed. Sections 4.7.4 and 5.6.3 have been revised accordingly.

9. Comment

Page 96, paragraph 2. Cranes forage in the desert and can be expected to use the range at both the Two Road site (lower probability) and at the Cheney Reservoir site. The biological assessment should reflect this use (25).

Response

It is acknowledged that whooping cranes forage in upland desert areas near the sites for food; Section 4.7.4 of this FEIS has been revised accordingly.

The issue of possible project-related impacts on the whooping crane at Cheney Reservoir was addressed in a Biological Assessment (DOE, 1983). The Biological Assessment (BA) concluded that remedial action activities at the Cheney Reservoir site would not have an adverse impact on the whooping crane. The FWS concurred with this opinion (Bolwahnn, 1983). Therefore, the DOE continues to believe that remedial action will have little impact on the whooping crane. As stated in earlier responses, the DOE has prepared a BA for remedial action at the Two Road site (DOE, 1986b,c). The whooping crane was not on the species list provided by the FWS and therefore was not considered in this BA.

10. Comment

Page 96, paragraph 6. We believe the black-footed ferret surveys completed by Biota Research and Consulting, Inc. should be reported in more detail (in Appendix H). The diurnal surveys found four ferret-like diggings which justified the completion of nocturnal surveys. While the nocturnal surveys were negative in results, it is conceivable that ferrets have utilized the area but were not present in the area while the nocturnal surveys were ongoing. It is important to recognize that completed ferret surveys are considered valid for only one year. Consequently, we recommend that the DOE should specify that surveys will be completed within one year of project construction to determine the presence or absence of ferret evidence. The conclusion made in the DEIS that this species "does not occur" seems inappropriate in view of the ferret-like diggings observed and in the numerous unconfirmed ferret sightings reported from the general area. A more appropriate conclusion is that the surveys "failed to document the presence of ferrets at the site" (25).

Response

The DOE recognizes that black-footed ferret surveys are valid for only one year; accordingly, Section 5.6.3 has been changed to acknowledge the need for follow-up surveys. The conclusion that the black-footed ferret "does not occur" was changed to "did not occur in 1985" at the Two Road site (Section 4.7.4). The complete black-footed ferret survey results are attached to the Two Road site BA (DOE, 1986c) provided to USFWS and will not be included in Appendix H of this FEIS.

11. Comment

Biological opinions are a consequence of formal consultation under the Endangered Species Act, initiated when lead Federal agencies make a "may affect" determination for Federally listed species. The biological assessment prepared by the Department of Energy in 1983 concluded "no affect" to Federally listed species. The USFWS concurred with that finding, and consultation under the Endangered Species Act was appropriately terminated without a biological opinion. This paragraph correctly recognizes that, because the project has significantly changed since 1983, compliance under the Endangered Species Act must again be satisfied by the DOE. The USFWS has been coordinating with the DOE and the consulting agencies to identify those issues that should be addressed in the new biological assessment. Therefore, no conclusions (such as in Section 5.6.3) should be made regarding the degree of impact to Federally listed fish species until completion of the biological assessment (and following review of any necessary biological opinion) (25).

Response

One of the purposes of an EIS is to assess the impacts of alternatives. Therefore, notwithstanding the requirements of the Section 7 consultation process, the FEIS will continue to assess impacts consistent with the BA (DOE, 1986c) and other correspondence with USFWS.

12. Comment

Only three species of water fowl are mentioned in Appendix H. Other waterfowl species also use the riparian corridor adjacent to the Grand Junction project site. These species include common merganser, common goldeneye, wood duck, pintail, green-winged teal, blue-winged teal, cinnamon teal, redhead, and canvasback. In addition, the Canada goose is common at this site. At the Two Road and Cheney Reservoir sites, chukar partridges are occasionally found (25).

Response

Agreed. Appendix H, Biological Information, of the DEIS should be modified. See the Errata Sheet, Section 6.25.

6.17 LAND USE AND LAND VALUES

Two main issues were addressed by commentors: the potential impacts to existing land uses from the relocation alternative and the perceived potential financial loss from remedial action and long-term stabilization.

1. Comment

We are definitely against the Cheney Reservoir site, 18 miles southeast of Grand Junction, for relocation of mill tailings. The site would be near the proposed Dominguez Reservoir on the Gunnison River. The Dominguez is a 26-mile reservoir to supply clean power, municipal and industrial water, and recreation to a continually growing population in the Grand Junction area, which is entirely dependent on reservoir storage water for its water needs. The last thing we need is to contend with a relocated mill tailings site in the reservoir area (7, 8, 16, 26, 28).

Response

As noted in response 1 Section 6.14, the U.S. Bureau of Reclamation indicated that Congress has never appropriated funds for the reservoir, that the need for the reservoir has never been established, and that it probably will not be constructed. In addition, the stabilized tailings (at the Cheney Reservoir site) would be several miles from the nearest part of the reservoir.

2. Comment

It was stated that the Cheney Reservoir area is a sparse grazing area, and I differ with that. There are several grazing permittees on the property in the spring, and again in the fall, and there are as many as a thousand head of cattle that graze in that immediate vicinity (1).

Response

As stated in the EIS, Section 4.9.3, the Cheney Reservoir site is within a BLM grazing allotment. The commentor is correct in stating that several permittees utilize the area in spring and fall. Four permittees share the 33,178-acre Kannah Creek grazing allotment and are permitted for 1621 AUMs. Permanent use restriction of 62 acres would not affect present use levels of the allotment.

3. Comment

The Mesa County Board of County Commissioners has adopted the Parks and Recreation Master Plan for the Colorado River Park System. The Grand Junction tailings removal is a critical factor in the development of this park system (24).

Response

The DOE agrees that stabilization of all tailings on site would affect the planned natural and open space nature of the proposed Colorado River Park System. However, relocation to the Cheney Reservoir site is DOE's preferred alternative.

4. Comment

Several commentors felt that there would be short-term adverse impacts to uses adjacent to the mill site, haul routes, and the disposal sites. The primary concern was the perceived financial loss that could be incurred if landowners were to sell during remedial action and the more general concern of deflated property values (1, 20, 23, 26).

Response

Short-term adverse impacts during remedial action to land uses were presented throughout Section 5.0 (e.g., noise annoyance, dust).

Regarding land values, the DOE has studied this issue very thoroughly in relation to remedial action at the South Salt Lake City, Utah, UMTRA Project site. This study was reported in the FEIS (DOE, 1984). It was found that land values for properties adjacent to the <u>unstabilized</u> tailings site were the same as for those properties further away. In Grand Junction, Colorado, residential and commercial developments have increased over the last 10 years on land adjacent to the tailings site; 50 to 60 housing units, several warehouses and commercial businesses, a sawmill, and a lumber yard were built according to Mr. Karl Metzner, Director of City Planning in Grand Junction (May 17, 1984).

Although the DOE disagrees with the commentors, any substantive information that supports the comments would be welcome.

5. Comment

The unidentified borrow area in Unaweep Canyon may or may not be on BLM lands. This should be clarified (25).

Response

The proposed borrow site in Unaweep Canyon has not been located specifically. However, the area under consideration is on land administered by the BLM.

6. Comment

The removal of 80 acres from an oil and gas lease would result in higher drilling and development costs as directional drilling could be necessary (see Section 5.7.3). Higher drilling and development costs might result in limited activity and foregoing some oil and gas reserves. Should DOE acquire the subsurface mineral rights through legislative action, the existing leases may be terminated. Impacts from such terminations need to be identified and analyzed (25).

Response

The existing oil and gas lease covers most of Section 11, as well as adjacent areas. If future market demand changed, it is possible that the lease may be found valuable for development; however, whether or not the ideal location to place a well is within the 80-acre Cheney Reservoir site is unknown at this time. If the only location to site a well for maximum recovery is within the restricted site area (unlikely), directional drilling would be necessary and would, in fact, impact the value of the lease due to the expense in this type of recovery.

7. Comment

Page 170, third paragraph. The Colorado-Ute 345 KV power line is now in place and energized (25).

Response

Section 5.7.3 of this FEIS has been modified.

8. Comment

Land use is now affected and will continue to be affected by tailings on vicinity properties. There is a major effect in that it deters development, and threatens health and economics. It should be a factor for all alternatives in Table 1.1 (26).

Response

The commentor is correct in that impacts to vicinity properties use may be affected currently and in the future under the no action alternative. However, after remedial action such impacts would no longer occur.

9. Comment

The description of impacts on land use, values, etc. is incorrect. Since 1972, the State has performed in excess of 22,150 gamma radiation surveys on planned building sites in Mesa County and has discovered over 1270 tailings deposits in that effort. Over 810 privately paid-for remedial actions have been completed on those sites. This number represents the number of vicinity properties remedial actions that would have had to have been addressed at considerably greater cost and effort by either GJRAP or the UMTRA Project had the Building Permit Survey program not responded to this community need. This represents an impact on the community that the DEIS has not considered. The large number of removals that did not take place because the property owner couldn't afford the remedial action costs attests to the additional impact that tailings in uncontrolled areas of the county can produce (26).

Response

The DOE recognizes that cleanup efforts have occurred prior to the UMTRA Project. The EIS assesses the existing costs and projected UMTRA Project costs, only. Although the DOE recognizes that costs for private cleanups and associated impacts have occurred, their consideration is beyond the scope of this EIS.

6.18 CULTURAL RESOURCES

Ten comments were received on a variety of issues.

1. Comment

On Table 1.1, archaeological resources and historic resources should simply be labeled "Cultural Resources." "Archaeological" does not mean prehistoric per se; historic resources may also be archaeological.

The table incorrectly states there would be no impacts. Under the single heading Cultural Resources there will be impacts under Alternatives 3, 4, 5, and 6. Impacts for Alternatives 1 and 2 and vicinity properties cannot be addressed until National Register of Historic Places (NRHP) determinations are made for historic properties. The statement (or lack thereof) on impacts is misleading. Regardless of mitigation, cultural resource values will be directly and/or indirectly affected. Under Section 106 of the Natural Historic Preservation Act of 1966 (PL89-665) consultation with the State Historic Preservation Officer (SHPO) determined that sites at the Cheney Reservoir site and the Two Road site are eligible for inclusion on the NRHP (25).

Response

Table 1.1 has been revised accordingly. However, Alternative 1 would still have no direct impacts to cultural resources. Further, in September, 1986, the SHPO determined that the sugar beet mill is not eligible for the NRHP.

2. Comment

Sections 4.11.2 and 4.11.3 and Appendix J, "Historical Resources" should read "Cultural Resources or Prehistoric and Historic Resources" (25).

Response

Sections 4.11.2 and 4.11.3 have been revised.

3. Comment

In general, the document has neglected to address the indirect impacts generally associated with increased access, visibility, and visitation. Vandalism is generally a problem in these kinds of situations, and the Indian Creek area possesses numerous sensitive cultural resource sites. DOE must make a determination of effect and develop a testing/mitigation plan for the four sites listed (25, 26).

Response

Vandalism requires that people know the locations of the archaeological resources and are intent on recovery or damage. The DOE has not nor does it intend to make public the locations of these sensitive resources. In addition, there is nothing currently preventing individuals from vandalizing the sites, should they wish.

A determination of effect and testing/mitigation plan will be developed prior to surface disturbance once the final locations of the tailings pile, access road, and staging areas are determined.

4. Comment

One eligible and one potentially eligible site would be affected by disposal at the Two Road site. Data recovery and mitigation measures would be developed in consultation with the State Historic Preservation Officer and BLM. Haul routes need to be identified and inventoried for cultural resource values (25, 26).

Response

As stated in Section 5.9.2 of the EIS, no cultural resources would be impacted by the remedial action activities at the Two Road disposal site. All sites that have been identified from Class III investigations are at least one mile south of the disposal site (see revised Section 4.11.3 of this FEIS).

Two Road (NW corner of Section 20, and Section 18) and the proposed haul road from Two Road to the disposal site have been surveyed; no resources were found. Other haul road routes and areas adjacent to Two Road will be surveyed once final modifications of the roads are determined during final design (if the Two Road site were selected).

5. Comment

Mitigation measures for cultural resources need to be identified in Section 5.20 (25).

Response

Mitigation measures will be identified if and when it is determined that eligible cultural resources would be impacted by disposal activities. Such a mitigation plan would be prepared in consultation with the SHPO and the BLM.

6. Comment

Appendix J-4. " . . . . disappearance of Formative Period brought a reemergence of nomadic, etc. . . ." This statement is not supported by the archaeological record. It would appear, based upon recent investigations, that the "nomads" never really disappeared. This section, like the EIS section, should be rethought (25).

Response

The commentor is correct in that recent evidence suggests that the nomadic archaic-type lifestyle continued through the Formative Period and into the Proto-Historic Period. Page J-4 of the DEIS should reflect this acknowledgement. See the Errata Sheet, Section 6.25.

7. Comment

Haul routes need to be inventoried for cultural resources (25).

Response

Although Class III surveys have been conducted for portions of haul roads for all alternatives, the DOE is aware that unsurveyed portions of the final selected routes must be inventoried for cultural resources.

8. Comment

In Appendix J.3.2, the statement that "These sites would not be impacted by remedial action" should be omitted. Add instead, "These sites will not be directly impacted by remedial action, as they are outside of the designated disposal area. Indirect impacts to these and prehistoric sites in the area are anticipated (resulting from increased accessibility and visitation)" (25).

Response

As noted in response 3 above, indirect impacts such as vandalism are not anticipated; regardless of the improved access, vandals, for example, would need to know the exact locations of resources (not available in this EIS).

9. Comment

The EIS should note that one vicinity property to date, the Presbyterian Church (5ME4156), has been determined eligible for inclusion in the National Register of Historic Places. The proposed remedial activities were determined to have no adverse effect on the historical significance of the property (26).

Response

The commentor is correct. However, given the number of properties to be cleaned up during the period of preparation of the FEIS, and the chance that several may be eligible, this FEIS has not been modified.

In general, eligible vicinity properties should not be affected by cleanup of contamination as the nature of contamination at sites more than 50 years old would not affect the structures themselves. The tailings usually were used for landscaping and similar activities at these properties.

10. Comment

It is our understanding that further information to comment on the eligibility of the Grand Junction Sugar Beet Factory/Climax Uranium Mill Site will be forthcoming in June, 1986. If the property is determined eligible, we look forward to further consultation regarding effects of the proposed action (26).

Response

The commentor is correct. The report addressing the sugar beet mill was sent to the SHPO in August, 1986; the SHPO has since determined that the sugar beet mill is not eligible for inclusion to the NRHP.

6.19 GEOLOGY

Six comments were received. Four addressed seismic issues.

1. Comment

The pattern for the Precambrian schists, gneiss, etc., on Figure 4.8 is appropriate for sedimentary rocks only, not metamorphics. Standard patterns for metamorphics are available and should be used (25).

Response

Agreed. Figure 4.8 has been revised.

2. Comment

The sinkhole(s) at the processing site should receive special attention during remedial action. It could be indicative of subtailings alluvial channelization which could be creating enhanced alluvial dispersal of contaminated tailings and other areas of hidden instability (26).

Response

Agreed. Sinkholes will be inspected during remedial action to assess the stability of the soils. If dispersal of materials has taken place, the cleanup of this material will be accomplished during the remedial action.

3. Comment

In Section 4.5.3, Mineral Resources, a reference is made to a gas producing well approximately four miles east of the Cheney Reservoir site. This well is close enough that more information should be provided, such as depth of producing zone and production formation. Also, the reference to a borehole just west of the Grand Junction site that had an oil-show at 96.5 feet should be further described (22).

Response

The gas well located four miles east of the Cheney Reservoir site is listed in the BLM files as having a total depth of 2841 feet, and being completed in the Dakota Sandstone at 2218 through 2284 feet. The well has been abandoned and probably plugged.

The "oil show," as documented in the log of boring number 725 near the Grand Junction processing site, is from the Dakota Sandstone. This show is of a very limited extent.

4. Comment

In Section E.2.1.3, Structure, and Section E.4.3.2.1, Uncompahgre Uplift, some descriptions of geologic structure that are discussed in the text are not labeled in the figures. Examples include the Redlands Fault, the Jacobs Ladder Fault complex, and the Book Cliffs monocline, which are discussed in the text but are not labeled in Figures E.2.3 or E.2.4. Also, the Ridgeway Fault and Fault No. 74 discussed on pages E4-13 are not shown on Figure E.4.3.3 (28).

Response

The commentor is correct, although the need for modifying the figures and text and reissuing the entire appendix is obviated by the fact that the conclusions drawn from such additonal information would not change. However, these figures have been modified and included as Figures 6.1 and 6.2.

5. Comment

In Section E.4.3.2, Colorado Plateau Province, possible ground accelerations of 0.34g were calculated as part of the seismotectonic study for the proposed Cheney Reservoir disposal site. These values are fairly high with respect to design of a disposal facility; consequently, more information is needed to properly relate geology to faulting (fracturing) in the local Cheney Reservoir site vicinity (28).

Response

The geology of the Cheney Reservoir site area is discussed in Section E.2.1.2 and again in Section E.2.4 of the DEIS. The faults near the Cheney Reservoir site are discussed in Section E.4.3.2.1 and in Table E.4.3.1 of the DEIS. In addition to these discussions in the EIS, more detailed discussions of the geology and faulting of the Cheney Reservoir site will be presented in the final design. The seismotectonic analysis

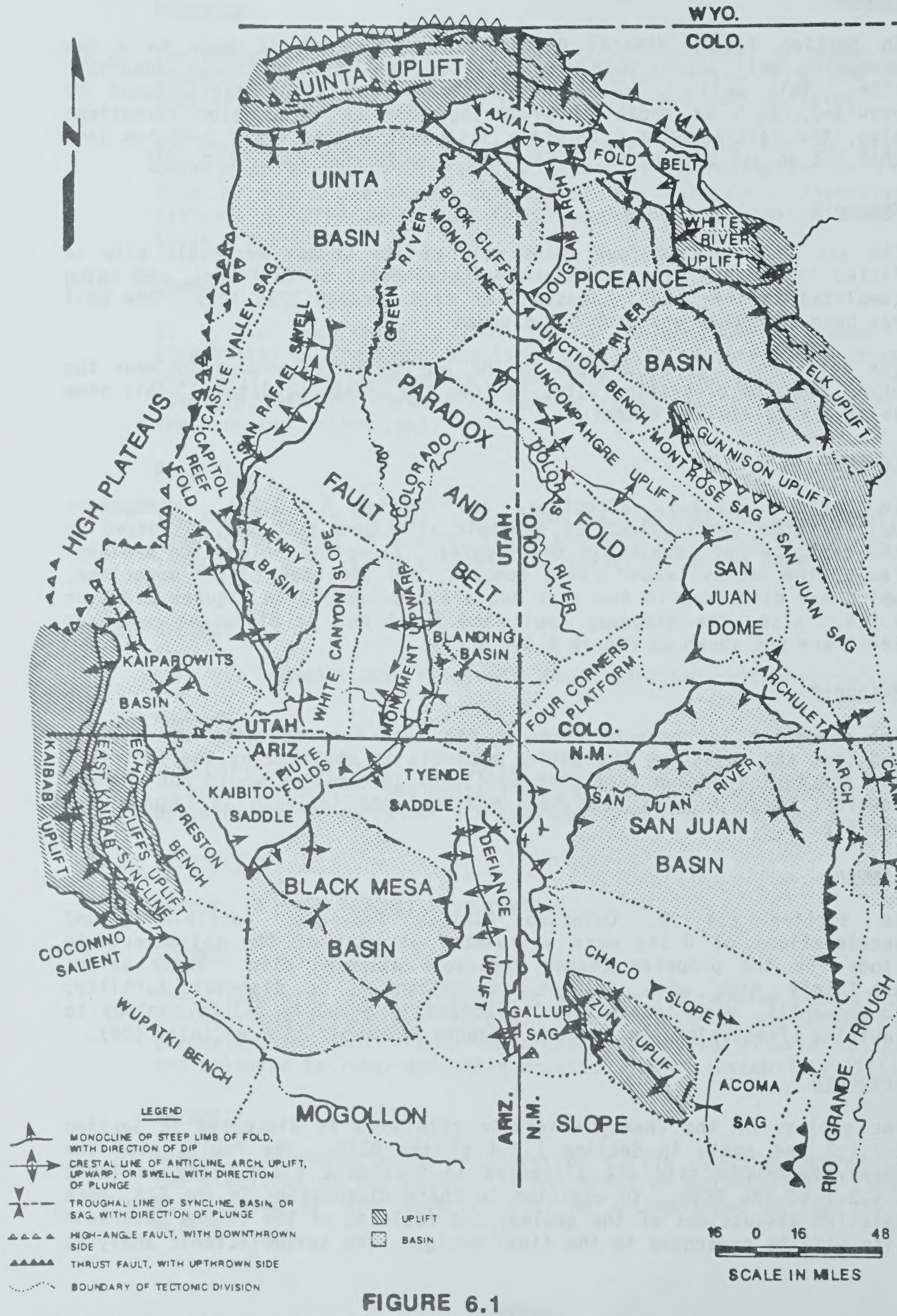


FIGURE 6.1
LOCATION AND TECTONIC SETTING OF THE GRAND JUNCTION AREA

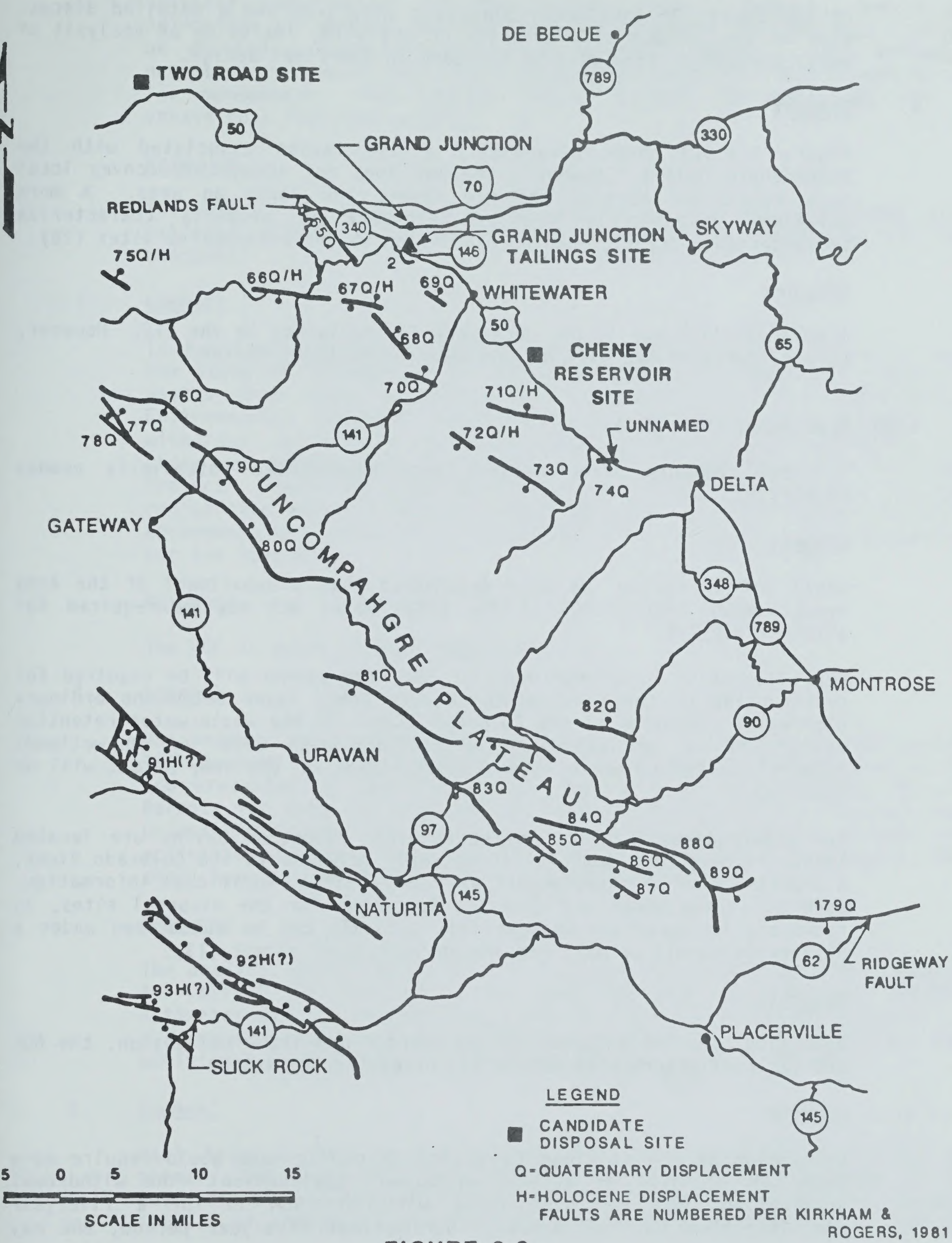


FIGURE 6.2
POTENTIALLY ACTIVE FAULTS ASSOCIATED WITH THE UNCOMPAHGRE UPLIFT

of the faults in the Cheney Reservoir site area and a detailed discussion of the seismic risk analysis of the site, including an analysis of on-site rupture, also will be included in the final design.

6. Comment

Figure E.4.3.3 shows potentially active faults associated with the Uncompahgre Uplift. However, the map does not adequately convey local site conditions because the map covers too large an area. A more detailed, larger-scale map is necessary to properly characterize seismotectonic activity and/or prediction at the alternative sites (28).

Response

A more detailed map is not necessary for inclusion in the EIS. However, such a requested map will be included in the final design.

6.20 REGULATORY COMPLIANCE

Six comments were received that highlighted potentially needed permits.

1. Comment

Based on our review, we have determined that a Department of the Army permit under Section 404 of the Clean Water Act may be required for alternatives 2-5.

For alternative 2, a Department of the Army permit will be required for construction of the six-foot-thick rock armor layer below the ordinary high water elevation of the Colorado River. If the waste-water retention basins are to be located below ordinary high water or in wetlands adjacent to the Colorado River, a Department of the Army permit will be required.

For alternatives 3-5, if the waste-water retention basins are located below ordinary high water or in wetlands adjacent to the Colorado River, a Department of the Army permit will be required. Additional information, such as stream names and crossing locations for the disposal sites, is necessary to ascertain whether this activity can be authorized under a nationwide permit or will require an individual permit (13).

Response

Depending upon the alternative implemented and its final design, the DOE and its contractors will obtain all necessary permits.

2. Comment

Relocation of the tailings to a site on public land would require more than BLM approval of a land withdrawal application. The withdrawal application that has been filed with the BLM is for a five-year administrative land withdrawal. During that five-year period, DOE may initiate construction of the disposal site. However, before any relocation of uranium mill tailings takes place, the DOE must seek and be granted a permanent withdrawal through Congress. Such action is necessary to ensure that the contaminated lands will not revert to BLM for management. The schedule should include the necessary time to obtain this legislation (25).

Response

The DOE is pursuing various measures with the BLM that will allow tailings relocation to take place. The DOE will abide by all such measures.

3. Comment

It has been suggested that the Cheney Reservoir site could also serve the State of Colorado or the EPA for disposal of low-level radioactive wastes from other cleanup actions, perhaps under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). The withdrawal application currently being processed by the BLM is for site study and preparation of a uranium mill tailings site under the UMTRA Project. Should the State of Colorado or EPA wish to locate a low-level radioactive material disposal facility with an UMTRA Project facility, agreements will have to be negotiated with the agency then responsible for the land (25).

Response

The DOE is aware of this responsibility.

4. Comment

Our primary concerns result from Table 5.6. A violation of the primary TSP standard is indicated from the air quality modeling performed by DOE and presented in Table 5.6. DOE will be required to obtain Emission Permits for both the mill site in Grand Junction and the disposal site. Unless sufficient emission control measures are applied to both site activities to prevent a (modeled) violation of the TSP standard, APCD shall have no choice but to deny the Emission Permits (26).

Response

The analysis contained in the EIS is overly conservative. The commentor is correct in that additional modeling and more refined emission estimates will be necessary as part of the emission permit process. If a (modeled) violation of the TSP standard occurs at this point, then additional control measures will be developed.

5. Comment

Haul truck traffic on unpaved roads is also expected to violate the primary TSP standards, as indicated in Table 5.6. Pursuant to the Colorado Air Quality Control Commission's Regulation No. 1, Section III.D., if complaints are registered with APCD that emissions from the unpaved roads are creating a nuisance, and if traffic count minimums are exceeded, APCD shall require the owner or operator of the roads to submit a control plan to abate the emissions from the roads. These provisions apply to county roads, as well as private roads, and the Mesa County Planning Department shall be provided with a copy of our comments to inform them of our requirements (26).

Response

The modeling results contained in Table 5.6 assumed a 50-percent reduction in fugitive dust emissions due to a water spraying program. The current project design calls for the graveling of unpaved haul roads along with the application of water and chemical dust suppressants. The estimated control efficiency associated with this type of program would be about 85 percent. Thus, the actual predicted impacts along the truck transportation routes would be about only 30 percent of the values presented in Table 5.6. However, if nuisance complaints are registered with the APCD, additional measures could be undertaken to mitigate the impacts as required.

6. Comment

Due to the location of the mill site in Grand Junction, the fugitive particulate emissions control plan, which DOE will be required to submit with the Emission Permit application, should reflect controls which provide the Lowest Achievable Emission Rate (LAER) due to the potential to emit radionuclides. Radionuclides are considered to be hazardous air pollutants by EPA. APCD shall carefully review the control plan for adequacy as Grand Junction is a non-attainment area for TSP. The non-attainment area status means that the area has not achieved the NAAQS for a particular pollutant. Please be advised that EPA is in the process of developing a PM10 Standard, and depending on the start-up date of the project, this new standard for particulate matter may affect modeling analyses as well as the non-attainment area status. Note: A control plan will be required for the disposal site as well, which will also be carefully reviewed (26).

Response

The DOE is aware of this information.

6.21 VICINITY PROPERTIES

Most of the comments received were from the State of Colorado. The state was most concerned with the lack of analysis regarding properties that will be unremediated because of their location, lack of standards exceedance, or DOE's ability to detect their presence.

1. Comment

There are two issues pertaining to the vicinities project that need to be addressed in the FEIS. They are:

- o On-going disposal at the repository of vicinities property tailings.
- o Disposition of vicinities sites not slated for cleanup (20).

Response

The impacts of on-going disposal of vicinity properties is addressed in a separate environmental assessment (DOE, 1986d), as noted in the Cover Sheet of the DEIS. The DEIS also examined the impacts of remedial action at all of the vicinity properties at a cleanup rate concurrent with remedial action at the mill site. Thus, these estimated impacts would tend to overestimate those from cleanup over a longer duration and of a lesser number (i.e., vicinity properties that remain to remediate when mill site cleanup is complete).

Regarding properties that contain tailings and do not exceed the standards, these will not be cleaned up by the UMTRA Project.

2. Comment

Continued hauling of vicinity properties tailings to the eventual repository site, probably for years after the mill site is removed, is not fully addressed. Reclamation and other pertinent problems arising from this situation should be addressed (20, 22).

Response

This EIS considered that all vicinity properties would be cleaned up during remedial action at the mill site in order to estimate an upper level of impacts. If vicinity property remediation continues after mill site remediation, then the intensity of impacts estimated by this EIS would decrease; however, their duration would increase.

If vicinity property cleanups continue after mill site remediation, the disposal site will be designed to accommodate the required future disposal. These details will be developed during final design of the selected alternative.

3. Comment

The estimate provided of 3465 properties to be formally included into the UMTRA Project and thereby require remedial action should be updated. A figure of 3977 was listed in a January 9, 1986, transmittal from the DOE to the State (26, 28).

Response

As of March 4, 1986, a total of 4145 vicinity properties had been identified for possible remedial action. Of the 4145, about 243 have been remediated, 119 were cleaned up since, about 137 were remediated under GJRAP, and 120 were not cleaned up because of owner refusal, leaving 3526 properties. Since 3526 is similar to the 3465 examined in the DEIS, and since estimated impacts are conservative, no changes are necessary for this FEIS.

4. Comment

Privately paid-for remedial actions are also being performed by property owners in conjunction with the Mesa County Building Permit Survey Program. Over 800 such private tailings removals have been completed to date (26).

Response

The commentor is correct. Section 3.1.1, and Section 3.2.9 have been revised accordingly.

5. Comment

The background value for radon daughter concentrations in the Grand Junction area is listed in the DEIS as ranging from approximately 0.005 to 0.007 WL (e.g. Section I.3.1). The average RDC value found in properties with structural contamination should, therefore, be expressed as a range from approximately 0.018 to 0.020 WL (26).

Response

The average is 0.018 WL; the range would be 0.018 to 0.20 WL. No change is necessary.

6. Comment

Section 5.7.5 does not take into account contaminated deposits left in uncontrolled areas. The last sentence is incorrect and fails to acknowledge the effort provided by the Building Permit Program (26).

Response

Known contaminated deposits in excess of the EPA standards will be removed during the life of the UMTRA Project. After completion of the UMTRA Project, such deposits will not be cleaned up by the DOE unless mandated (and funds appropriated) by Congress.

7. Comment

The two-month disturbance time referred to in Section 5.7.5 is not consistent with the one-month estimate provided in Sections 5.8.3 and 5.17 (26).

Response

One month is correct. Section 5.7.5 has been revised.

8. Comment

The DEIS indicates that out of over 6900 known contaminated vicinity sites, less than 4000 will be cleaned up by the UMTRA Project. Large volumes of contaminated deposits will be left in uncontrolled areas within communities of Mesa County. These deposits will include, among others, those tailings deposits which are undiscovered, and those which, due to their defined volume, do not appear to exceed the EPA standards. Existing instrumentation and measurement techniques are not sensitive enough to allow detection or complete identification of presently shielded or partially shielded deposits.

Experience gained in Mesa County during the past 14 years indicates that many of these deposits will be disturbed, moved, spread, or built over in the normal progression of renewal within the community. These tailings deposits must be controlled to ensure that the radiation exposure to the public - primarily alpha radiation exposure through elevated radon levels in structures built over or adjacent to these deposits - is not increased. This effort will continue to impact state and local governments long into the future. What is planned to mitigate these consequences (26)?

Response

The EPA standards were developed to ensure that potential health hazards due to radon exposure are minimized. The standards are used as guidelines to remove known (i.e., measurable) quantities of contaminated material. Tailings that do not exceed standards based on measurements are not removed. Properties located in excess of the standards (either new properties or due to excavation or construction practices) while the UMTRA Project is ongoing will be remediated; properties found after conclusion of the UMTRA Project will not be remediated by the DOE unless Congress mandates and appropriates funds.

9. Comment

The continual spreading of contamination in uncontrolled ways through human misuse should also be discussed (26).

Response

The impacts from the uncontrolled spread of tailings are addressed under the no action alternative in Sections 3.0 and 5.0 of the EIS.

10. Comment

Page A-7, paragraph 2. The description appears to misrepresent the EPA indoor RDC standard. 40 CFR 192.12 states that "the objective of remedial action shall be, and reasonable effort shall be made to achieve . . . an indoor RDC not to exceed 0.02 WL." If after remedial action has been performed the indoor RDC level is between 0.02 and 0.03 WL, the implementing agencies would then consider what further action should be taken to comply with the Standard (26).

Response

Agreed. This section should be rewritten to indicate that reasonable effort should be made to achieve an indoor RDC of 0.02 WL. See the Errata Sheet, Section 6.25.

11. Comment

Page L-2, paragraph 5, 1st and 2nd sentence, should be revised to: "Approximately 640 vicinity properties have been identified as qualifying for remedial action under GJRAP and remedial action has been performed at approximately 570 properties. Of the 640 properties . . ." (26).

Response

Agreed. Appendix L of the DEIS should be modified accordingly. See the Errata Sheet, Section 6.25.

12. Comment

Table L.1.1, Item 6 - "GJRAP will involve clean-up of about 600 buildings." (26).

Response

Agreed. Table L.1.1 of the DEIS should be modified accordingly. See the Errata Sheet, Section 6.25.

13. Comment

Schools are listed in the commercial vicinity properties category. Should they not be considered separately (26)?

Response

Schools are listed in the commercial category because their occupancy characteristics, 5 days at about 8 hours per day, are similar to other buildings in the commercial category.

14. Comment

Page L-5, paragraph 3. Recommend revising "complex" to "complex or unusually significant" (26).

Response

Agreed. Section L.2 of the DEIS should be modified accordingly. See the Errata Sheet, Section 6.25.

15. Comment

Page L-7, paragraph 3, 3rd sentence - "In addition, between 1969 and the present, on-site surveys . . ." (26).

Response

Agreed. Section L.3.2 of the DEIS should be modified accordingly. See the Errata Sheet, Section 6.25.

16. Comment

Figure L.3.1 is misleading in that it leads one to believe that the whole process for a location will be completed in 14 months, when in most cases it is longer (26).

Response

The text of Section L.3.1 clearly states that the generic schedule is provided ". . . to illustrate the steps of the process and the relative time required to accomplish (emphasis added) each task."

17. Comment

Page L-9, paragraph 4, last sentence - recommend rephrasing as: "The Radiological and Engineering Assessment (REA) defines the areal extent and depth of all radioactive mill residues on the site" (26).

Response

Agreed. Section L.3.3 of the DEIS should be modified accordingly. See the Errata Sheet, Section 6.25.

18. Comment

Page L-10, paragraph 2, 3rd sentence - recommend rephrasing as: ". . . ., the drill hole depth may not be sufficiently deep to penetrate the contamination, and may or may not allow one to accurately define the depth to clean material." (26).

Response

Agreed. Section L.3.3 of the DEIS should be modified accordingly. See the Errata Sheet, Section 6.25.

19. Comment

The state also signs the RAA and pays for 10 percent of the cost of construction (26).

Response

Agreed.

20. Comment

Page L-13, paragraph 1. Appendix C is not used anymore (26).

Response

Agreed. Section L.3.4 of the DEIS should be modified accordingly. See the Errata Sheet, Section 6.25.

21. Comment

The EIS needs to further address the impacts that result from tailings deposits which now exist and the large volume of deposits which will be left in uncontrolled areas within communities of Mesa County. These will consist of deposits defined as falling under the categories of: (1) supplemental standards; (2) deposits that, due to their defined volume, do not appear to exceed the EPA Standards; and (3) deposits which were never identified, such as those where no known procedure or instrumentation is available to detect deposits which are at present highly shielded (26).

Response

The EIS assumed that all eligible vicinity properties would be cleaned up to EPA standards; impacts were estimated in a very conservative fashion. Impacts of those remaining, by their very nature as unremediated, are beyond the scope of this EIS.

Also see response to comment 8.

22. Comment

Our primary concern is the potential for future alpha radiation exposure through elevated radon levels in structures built over or adjacent to these residual deposits. Many of these deposits will be disturbed, moved, spread, or built over (or adjacent to) as a result of normal growth and renewal processes within these communities. Experience documented in Mesa County, Rifle, and Durango in the last 14 years indicates that the likelihood of this situation occurring in the near future is great. In Mesa County alone, since 1972 the state has performed over 22,100 gamma radiation surveys on planned building sites, discovered 1273 tailings deposits in that effort, and documented over 810 privately paid-for tailings removals as a result of the ongoing Building Permit Survey Program. These removals, performed so that property owners could sell or build on land affected by tailings, were done because GJRAP and UMTRA Project could not respond in a timely fashion to the immediate needs of the community. This represents an impact on a community that the DEIS does not consider (26).

Response

The purpose of the EIS is to examine the impacts from remedial action, not to examine the impacts of past activities.

23. Comment

Page 47, paragraph 8. Nothing is noted about deposits now under structures that are not being removed, but could pose a problem if the existing structure was torn down and a new tighter structure was constructed over the old deposit. This type of deposit, and others not discussed in the DEIS, indicate that the last statement made in this paragraph is invalid and should therefore be omitted (26).

Response

Under UMTRA Project guidelines, once a property has been certified as having been cleaned up to within EPA standards, the property is eligible for unrestricted use and sale. If evidence were received that after stuctural modification, or land excavation, a formerly certified property was no longer in compliance with the standards, and the UMTRA Project was ongoing, the DOE would make a reasonable effort to re-examine the structure and to bring the property into compliance.

6.22 SURVEILLANCE

1. Comment

It would be relatively easy to disrupt the tailings site by human interference. Further information is needed as to how the DOE proposes to manage the site to avoid human tampering over the next 200 years or so (9).

Response

The DOE disagrees that it would be relatively easy to disrupt a stabilized site because of the thick radon and rock protective covers. These covers would require a deliberate, mechanized effort. For example, an individual would need to transport a back-hoe and dump truck over a gravelled road to purposely disrupt the stabilized site.

The framework and general elements of a post-remedial action surveillance and maintenance (S/M) plan are described in Section 5.21 of the EIS. The site-specific S/M plan will be developed in consultation with the NRC about six months prior to the completion of remedial action.

2. Comment

Monitoring wells should be installed downgradient from the Cheney Reservoir site which could be sampled for contaminants following tailings burial (26).

Response

See response to Comment 1 regarding the timing of the site-specific S/M plan and its elements.

3. Comment

Post remedial action radiation monitoring and institutional controls for both the reclaimed mill site and repository must be included (22).

Response

Surveillance and maintenance under the license to be issued by the NRC will occur only at the disposal site; with relocation, only the repository will be monitored. In addition, radiation monitoring will not be performed as the EPA standards are design not performance standards.

Also see response 1 above.

6.23 PUBLIC PARTICIPATION

1. Comment

As a general comment on the DEIS, I want to express my disappointment that the development of the transportation plan is outside the public comment process. I urge DOE to solicit public comment during the design phase so that all concerns can be heard. This will result in a transportation plan that will be less disruptive to the community during the long construction process (5).

Response

Development of the transportation plan is not outside of the public comment process. All comments and recommendations generated by review of the DEIS will be considered during the final design to determine the safest and least disruptive routes. The task force and local community will be informed of developments as they occur.

2. Comment

Public attitudes - 1st paragraph - The Mesa County Building Permit Survey Program has also increased public awareness of the hazards associated with tailings, as have local lending agencies, realtors, etc. . . . (26).

Response

Agreed. Section 4.12.8 has been revised.

6.24 MISCELLANEOUS

A variety of comments called for correction of inconsistencies and other errors.

1. Comment

Pages 207 and 208. Repeated statements, such as "Remedial action workers would be exposed to above-background levels of radiation and the possibility of construction related accidents," imply these impacts would be the same for all alternatives. The Grand Junction site would most likely be different in the level of impacts offered, from the other two sites, because of reduced handling of materials. A summary of the differences should be presented (25).

Response

Such a requested summary of remedial action worker health effects can be found in Table 1.1 of the EIS.

2. Comment

The last sentence on page 1, paragraph 3 is an oversimplification. Recommendation is to rephrase as: "Since 1971 a building permit gamma survey program has been in effect in Mesa County to help prevent the continued misuse of these tailings." (26).

Response

The DOE is aware of this program. Please see response 4 of Section 6.21.

3. Comment

Page 6, paragraph 1, 5th sentence - recommend rephrasing as: "The tailings and contaminated material would be covered with an earthen radon barrier and capped with other earthen materials for long-term protection against the disruptive effects of erosion, plant and animal intrusion, dessication, and freeze-thaw/frost heave." (26).

Response

These additional disruptive natural forces are fully described in Appendix B, Engineering Designs, of the DEIS.

4. Comment

Page 8, paragraph 2, 5th sentence - recommend rephrasing as: "Winds are most frequently from the southeast, or to a lesser extent from the northwest, . . ." (26).

Response

Section 1.3 has been revised.

5. Comment

Page 19, paragraph 1, 2nd sentence - recommend rephrasing as: " . . . around Mesa County" vs. "around Grand Junction" (26).

Response

Section 3.1.1 has been revised.

6. Comment

Page 22, paragraph 3. The tailings pile and vicinity properties would not remain in their present condition (because of this dispersion by wind, erosion, uncontrolled misuse by man, . . .) (26).

Response

Section 3.2.2 has been revised.

7. Comment

Township and range of the Cheney Reservoir and Two Road sites should be indicated on Figures 4.4 and 4.5 (26).

Response

Agreed. Figures 4.4 and 4.5 have been revised.

8. Comment

Page 78, paragraph 5, 1st sentence - The Grand Junction tailings site, the alternate disposal sites, . . . (26).

Response

Comment acknowledged.

9. Comment

The description of the Cheney Reservoir site on page 165 is not consistent with an earlier description on page 33. That is, the area of the stabilized pile is stated to be 80 acres on page 165, but 62 acres on page 33. Also, there is inconsistency between the stated 120 acres (total) and the stabilized pile area of 80 acres plus the 58 acres of reclaimed wildlife habitat (27).

Response

Section 5.6.1 has been revised to be consistent with Section 3.2.4 (62 acres is correct as is 18 acres to be reclaimed).

10. Comment

The description of the Two Road site on page 208 is not consistent with an earlier description on page 165. On page 165, the site is described in terms of 80 acres (total) disturbed. Of this 80 acres total, the stabilized pile would cover 62 acres and represents a loss of wildlife habitat. However, the residual 18 acres would be reclaimed as wildlife habitat. Yet, the implication on page 208 is a total loss of 80 acres. Is the apparent inconsistency due to reclamation of the 18 acres for wildlife, but not the former use of low density grazing (27)?

Response

Section 5.17 has been revised to indicate that 62 acres will be lost.

11. Comment

Page 140, paragraph 1. The word "Gaussian" is misspelled (26).

Response

The text has been revised.

12. Comment

(4.12.7 Transportation Networks, Regional Networks, p. 120, third paragraph, third sentence) . . . and a passenger train that runs daily (24).

Response

Agreed. Sections 4.12.7 and K.1.7 of this FEIS have been revised. See the Errata Sheet, Section 6.25.

13. Comment

Pages 50-54, 173-174. Define and quantify "large" increases in truck traffic in terms of percent increase (25).

Response

The requested information is shown in Table 5.11, Section 5.13.1.

14. Comment

Figure 4.16. 32 Road is mislabeled; State Highway (SH) 146 is now designated as SH 141; 29, 30 and 31 Roads do not cross the Colorado River (26).

Response

Figure 4.16 has been revised.

15. Comment

Page 127, paragraph 3, 2nd sentence - recommend rephrasing as: " . . . truck trips would also be taken from the specific site to and from various commercial sand and gravel distributing sites, and/or the 32 and C-1/2 borrow site . . ." (26).

Response

Section 4.12.7 has been revised.

16. Comment

Page 195, paragraph 3, 2nd sentence - The improvements on State Highway 146 (32 Road), now designated SH 141, are now complete and are located north of the D Road. The Colorado Department of Highways has no improvements planned for the segment of SH 141 between D Road south to Highway U.S. 50 (26).

Response

Section 5.13.2 has been revised.

17. Comment

Page 81, paragraph 1, 2nd sentence: Change "Perdy" to "Purdy" (25).

Response

Section 4.6.1 of this FEIS has been revised.

18. Comment

Page 81, paragraph 5, recommend adding a phrase that "The washes on the site are occasionally incised to depths of five feet or more and some show steep banks indicative of rapid erosion" (26).

Response

Agreed. Section 4.6.1 has been revised.

19. Comment

Page 158, paragraph 5, 3rd sentence - " . . . and would stabilize near 8.8 to 52 pCi/l after approximately 100 years." (26).

Response

This sentence has been corrected.

20. Comment

Abbreviations and Acronyms: "NRC" stands for Nuclear Regulatory Commission, not Nuclear Regulatory Agency (28).

Response

Abbreviations and Acronyms have been revised.

21. Comment

List of Agencies, Organizations and Persons to whom copies of this statement are being sent: Under Nuclear Regulatory Commission, the name Paul Hildenbrand should be changed to Raymond Gonzales (28).

Response

This list has been revised.

22. Comment

Table F.3.4, page F-55, several references to Table F.3.4 are made that are actually references to Table F.3.5.

Response

Agreed. The correction has been made.

6.25 COMMENTS OUTSIDE THE SCOPE OF THE EIS AND ERRATA SHEET

Several comments that were outside the scope of the EIS were received. Table 6.2 lists commentors that expressed preferences for alternatives.

1. Comment

If Cheney Reservoir were selected and there were a renewal of uranium processing activities, would this continue to likely be the area to place the tailings (1)?

Response

At this time, it is impossible to estimate the likelihood of future disposal.

2. Comment

I came here today to express my support for the remedial action program. The mill tailings pile represents a long-term health and environmental hazard and should be stabilized. I strongly urge Congress and the State Legislature of Colorado to continue to allocate funds for this project (5).

Response

No response required.

3. Comment

Clarify liability issues involved with this project. Provide information on Price-Anderson. (Federal Indemnification Act) (20).

Response

In the case of a nuclear related accident, Price-Anderson assures the availability of a large sum of money to compensate any member of the public who has suffered a loss. It provides for immediate emergency reimbursement for costs associated with evacuation. For non-emergency claims, it establishes certain procedures to facilitate recovery. Price-Anderson also puts a cap on the industry's liability for each nuclear incident, while at the same time it provides a guarantee that the Federal Government will review the need for compensation beyond this amount. Thus, Price-Anderson is a closely integrated package that balances the benefits of public protection features against a predictable level of financial exposure for the industry.

4. Comment

The best alternative would be to stabilize the present site, make it into a park, and to open the river to fishing (19).

Response

No response required.

Table 6.2 Preferences as stated by various commentors

Alternatives	In favor	Total by alternative	Opposed	Total by alternative
Alternative 1				
No action		0		0
Alternative 2				
Stabilization on the Grand Junction site	3, 11, 16, 19	4		0
Alternatives 3 and 4				
Disposal at the Cheney Reservoir site	17	1	1, 2, 3, 7, 16, 18, 19, 24	8
Alternatives 5 and 6				
Disposal at the Two Road site	1, 2, 16, 20, 22, 24	6	3, 11	2

ERRATA SHEET

GRAND JUNCITON EIS APPENDICES

APPENDIX A

Page A-7, paragraph 2, 1st sentence, change to read: "The standard requires that reasonable effort should be made to achieve an indoor RDC not to exceed 0.02 WL."

APPENDIX B

Page B-19, paragraph 6, 2nd sentence, change to read: "Uncontaminated materials excavated from each pond . . ."

Page B-35, first "bullet" under the Cheney Reservoir Site, change to read: ". . . (approximately four miles)."

Page B-53, paragraph 5, 4th sentence, change to read: ". . . the Grand Junction city limits, D Road from 15th Street to S.H. 141, . . ."

Page B-55, last paragraph, first sentence, change 1.1 to 1.0.

Page B-56, paragraph 2, first sentence, delete word "hazard."

Page B-56, paragraph 3, delete the existing paragraph and replace with:

> "This potential for differential settlement, however, is expected to be eliminated or significantly reduced for many reasons. First, observations made at other UMTRA Project sites revealed that normal excavation and placement procedures provide sufficient mixing to prevent the relocation and placement of extensive layers of slimes. Second, the presence of a localized concentration of slimes, when compacted to the densities to be outlined in the design and construction specifications, will not significantly affect the stability or settlement of the final pile. Third, the tailings material properties which will be used in the analyses performed in compiling the final design will be representative of the materials placed in the pile. The construction specifications will include the necessary guidelines for the contractor to achieve the material properties required to ensure a stable pile. On-site quality control will maintain both appropriate compaction and placement of these tailings materials as per construction specifications."

Page B-56, paragraph 5, last sentence, change to read: "This would restrict water buildup over the earth cover and reduce freeze/thaw, . . ."

Page B-63, paragraph 4, last sentence, change Section B.3.6 to B.4.6.

Page B-82, Table B.5.1, for months 7-14, for "Crane" change to "1 1 1 1 0 0 0 0." In addition, change "Truck" to read "10-cy truck with 8-cy pup."

Page B-83, Table B.5.2, for month 16, under "Truck drivers" change: 54 to 59; for month 2, under "Total man-months" change 48 to 45.

Page B-84, Table B.5.3, for "Total equipment months by type": under "Compactor," change 66 to 64; and under "Total pieces," change 2338 to 2336.

Page B-85, Table B.5.4, for months 33 to 34, under "Total man-months," change 146 to 145.

Page B-86, Table B.5.5, for "Total equipment months by type," under "Compactor" change 66 to 64. In addition, for "Total pieces," change the last two numbers (185 and 5305) to 65 and 5303, respectively.

Page B-88, Table B.5.7, for month 17, under "10-cy truck" change 0 to 4.

Page B-90, Table B.5.9, for month 34, under "Total pieces" change 193 to 73.

Page B-91, Table B.5.10, for month 12, under "Laborers," change 6 to 5. Also, for month 2, under "Total man-months" change 60 to 62.

Page B-92, Table B.5.11, for "Cheney Reservoir truck," under "Front end loader," change 407,500 to 193,000. Also for "Totals," change the following: 4,947,800 to 4,733,300; 5,146,860 to 5,146,900; and 6,818,000 to 6,817,700.

APPENDIX C

Page C-23, Table C.3.6, for "Hydrologic criteria, distance to rivers, lakes, etc.," add a 2 under the "Weight" column.

Page C-24, Table C.3.7, for "Lucas Mesa," under subtotal for "Hydrologic criteria," change 10.1 to 13.1.

Page C-25, paragraph 1, change to read: "The weighted scores for the hydrologic criteria range from 12.3 to 16.2 points. The 6 and 50 Reservoir, Cheney Reservoir, and Lucas Mesa sites were rated about the same, with 12.3, 13.6, and 13.1 points . . ." Delete the last sentence.

APPENDIX E

Page E-13, paragraph 2, should be deleted and replaced with the following:

> "The Mancos Shale underlies the entire Grand Valley and forms the Book Cliffs and the base of Grand Mesa. This formation lies conformably on the Dakota Sandstone and consists of a thick sequence of gray, fissile shale with several thin (less than two to three feet) sandstone beds. A given sandstone bed can have considerable variation in porosity and permeability, as well as in thickness. The sands at the base of the Mancos Shale are transitional with the Dakota and could be interpreted to be

either formation. Sands within the Mancos Shale in the vicinity of the Grand Junction site should not be considered as aquifers since they tend to be thin and discontinuous. In addition, the vertical permeability of the Mancos Shale is low and its thickness is so great that vertical migration of fluids into overlying and underlying units is very unlikely."

Page E4-10, paragraph 6, change Herrmann et al., 1970 to 1980.

Page E4-29, add the following references:

Kelley, V. C., and N. J. Clinton, 1960. Fracture Systems and Tectonic Elements of the Colorado Plateau, University of New Mexico Publications in Geology No. 6, University of New Mexico Press, Albuquerque, New Mexico.

Pearthree et al. (P. A. Pearthree, C. M. Menges, and L. Mayer), 1983. Distribution, Recurrence, and Possible Tectonic Implications of Late-Quaternary Faulting in Arizona, Arizona Bureau of Geology and Mineral Technology, Open-File Report 83-20.

Sullivan et al. (J. T. Sullivan, C. A. Meeder, R. A. Martin, Jr., and M. W. West), 1980. "Seismic Hazard Evaluation - Ridgway Dam and Reservoir Site - Dallas Creek Project, Colorado," Unpublished Report, U.S. Water and Power Resources Services, Seismotectonic Section, Denver, Colorado.

Page E4-31, "Sanford et al.," change 1979 to 1981.

APPENDIX H

Page H-3, Table H.1.1, add the following birds:

Location	Scientific name	Common name
1	Aix sponsa	wood duck
2,3	Alectoris graeca	chukar partridge
1	Anas acuta	pintail
1	Anas carolinensis	green-winged teal
1	Anas cyanoptera	cinnamon teal
1	Anas discors	blue-winged teal
1	Aythya americana	redhead
1	Aythya valisineria	canvasback
1	Branta canadensis	Canadian goose
1	Bucephala clangula	common goldeneye
1	Mergus merganser	common merganser

APPENDIX I

Page I-7, last line, change 4.38 to 3.86.

Page I-15, paragraph 3, last sentence, change to read: "The concentration of Rn-222 at the Cheney Reservoir site was 0.47 pCi/l.

Page I-32, paragraph 2, change 4.38 to 3.86.

Page I-32, paragraph 3, change the following: 4.38 to 3.86; 2.75 to 2.42; and 0.550 to 0.485.

Page I-32, paragraph 5, 2nd sentence, change 31 mem/yr to 31 mrem/yr.

Page I-38, paragraph 1, change the following: 4.38 to 3.86; 1.44 to 1.27; and 0.287 to 0.253.

Page I-41, paragraph 3, change the following: 4.38 to 3.86; 1.44 to 1.27; and 0.288 to 0.254.

Page I-46, Table I.5.13, change the following: 60 to 75; and 717 and 732.

Page I-47, paragraph 4, change 1.44 to 1.27.

Page I-50, paragraph 5, change first sentence to read "The radon concentration may be . . ." Also, change 2.21 to 3.86 and 9.1 to 15.8.

Page I-51, Table I.5.18, change the following: 3.89 to 4, 38.9 to 40, and 389.0 to 400.

Page I-62, last paragraph, change Table I.5.4 to Table 5.4.

APPENDIX J

Page J-4, paragraph 1, delete the first two sentences and replace with: "The Formative Period was followed by the Proto-Historic period. Hunting and gathering were the primary subsistence base. Recent archaeological evidence indicates that the nomadic, archaic-type lifestyle continued through the Formative Period and into the Proto-Historic."

Page J-5, paragraph 2, 8th sentence, change to read ". . . structures were demolished and/or extensively altered."

Page J-5, paragraph 2, 9th sentence, replace with "The SHPO, in September, 1986, determined that the site is ineligible to the NRHP."

Page J-5, paragraph 3, delete entire paragraph.

APPENDIX K

Page K-1, paragraph 2, change reference date for Colorado Department of Local Affairs from 1985 to 1984.

Page K-7, Table K-15, replace with new Table K.1.5 (see attached).

Page K-10, Table K.1.8, replace with new Table K.1.8 (see attached).

Page K-14, Table K.1.11, for "Total," under 1980 and 1982, change 307.3 to 307.6 and 383.6 to 391.6.

Page K-16, Table K.1.12, for "1975," under "Durable goods," change 10,674,000 to 10,694,000. Also change the reference (USDOE, 1982b) to (Regional Economic Information System).

Page K-23, paragraph 2, 4th sentence, change to read: ". . . six council members, <u>except for Grand Junction which has a seven-member council</u>."

Page K-26, Table K.1.21, change the reference 1984b to 1984a.

Page K-27, Table K.1.22, change the reference 1984 to 1984b.

Page K-31, paragraph 6, change 20.0 to 12.5.

Page K-33, Table K.1.26, for "Grand Junction," change the following: 28,500 to 19,000; 9.98 to 6.65; and 4.28 to 2.85. Also, delete the last line of the table "^{c}Total . . ."

Page K-34, Table K.1.27, change 20.00 to 12.5.

Page K-39, paragraph 2, 4th sentence, change to read: ". . . trains per day and a <u>daily</u> passenger train.

APPENDIX L

Page L-2, paragraph 5, change 650 to 640 and 500 to 570.

Page L-3, Table L.1.1, Item 6, change 650 to 600.

Page L-5, last paragraph, 1st sentence, change to read: "Complex <u>or unusually significant</u> vicinity . . ."

Page L-7, paragraph 3, last sentence, change to read: "In addition, between <u>1969</u> and <u>the present</u>, . . ."

Page L-8, Figure L.3.1, delete the "Sign Appendix C" line.

Page L-9, paragraph 4, last sentence, change to read: ". . . and depth of <u>all</u> tailings material <u>on the site</u>."

Page L-10, paragraph 2, last sentence, change to read: ". . . the contamination <u>and</u> may <u>or may not allow one to accurately define</u> the depth to clean material."

Page L-13, paragraph 1, delete last three sentences.

Table K.1.5 Labor and proprietors' income by place of work for the United States and the State of Colorado, 1975 and 1980[a] (in thousands of dollars)

Income category	United States 1975	United States 1980	United States Percent	Colorado 1975	Colorado 1980	Colorado Percent
BY TYPE						
Wage and salary disbursements	800,828,000	1,351,644,000	--	9,973,922	19,119,328	--
Other labor income	64,489,000	127,943,000	--	671,845	1,518,250	--
Proprietors' income	89,327,000	114,058,000	--	1,360,641	1,979,296	--
Farm	23,927,000	18,424,000	--	472,527	317,820	--
Nonfarm	65,400,000	95,634,000	--	888,114	1,661,476	--
BY INDUSTRY						
Farm	30,264,000	29,395,000	1.8	560,566	484,765	2.1
Nonfarm	924,380,000	1,564,250,000	98.2	11,445,842	22,132,109	97.9
Private	750,299,000	1,301,600,000	81.7	8,741,361	17,999,717	79.6
Agricultural services, forestry, fisheries, and other	3,638,000	6,429,000	0.4	41,928	80,708	0.4
Mining	13,592,000	28,593,000	1.8	357,908	1,095,111	4.8
Construction	55,470,000	94,633,000	5.9	825,036	1,731,554	7.7
Manufacturing	240,674,000	412,134,000	25.9	1,835,319	3,731,473	16.5
Nondurable goods	89,057,000	145,826,000	9.2	690,164	1,173,733	5.2
Durable goods	151,617,000	266,308,000	16.7	1,145,155	2,557,700	11.3
Transportation and public utilities	70,293,000	123,758,000	7.8	924,204	1,932,234	8.5
Wholesale trade	63,961,000	108,888,000	6.8	796,724	1,533,148	6.8
Retail trade	98,135,000	153,067,000	9.8	1,342,615	2,382,805	10.5
Finance, insurance, and real estate	49,429,000	92,627,000	5.8	629,790	1,473,805	6.5
services	155,107,000	281,471,000	17.7	1,988,837	4,039,388	17.9
Government and government enterprises	174,081,000	262,650,000	16.5	2,703,481	4,132,392	18.3
Federal, civilian	41,976,000	62,027,000	3.9	722,555	1,059,289	4.7
Federal, military	17,906,000	23,859,000	1.5	475,353	515,916	2.3
State and local	114,199,000	176,764,000	11.1	1,505,573	2,557,187	11.3

[a]Data from U.S. Department of Commerce (USDOC, 1985a, 1982b, Tables 1 and 5).

Table K.1.8 Personal income for Mesa County, 1975 and 1980[a]
(in thousands of dollars)

Income category	1975	1980
Total labor and proprietors' income	236,285	525,410
Personal contributions for social insurance	-12,022	-27,692
Residence adjustment	185	3,731
Net labor and proprietors' income	224,448	501,449
Dividends, interest, and rent	51,443	134,208
Transfer payments	48,945	86,540
Personal income	324,836	722,197
Total population (thousands)	63.3	82.8
Per capita personal income (dollars)	5,135	8,726

[a]Data from U.S. Department of Commerce (USDOC, 1985a, 1982b, Table 5).

6.26 COPIES OF LETTERS

This section reproduces the written statements submitted on the draft environmental impact statement for remedial action at the inactive uranium mill site located in Grand Junction, Colorado.

The substantive comments in each letter have been bracketed and numbered to indicate where they have been addressed within Section 6.0. Each letter or statement also has a number in the upper right corner which identifies the author. A numerical cross index is provided in Table 6.1

Copies of the public hearing transcripts are available in the reading rooms of the libraries listed in Table 6.3.

Central Grand Valley Sanitation District

P.O. Box 40219
Grand Junction, Colorado 81504
Phone 434-3642

May 29, 1986

John G. Themelis, Project Manager
Uranium Mill Tailings Project Office
Department of Energy
5301 Central Avenue, N.E. Suite 1700
Albuquerque, New Mexico 87108

Dear Mr. Themelis:

I am writing to you regarding the "Draft Enviremental Impact Statement" on the "Remedial Actions at the former Climax Uranium Company Uranium Mill Site, Grand Junction, Mesa County, Colorado."

6.6.7 The draft does not address the problems of repair or reconstruction of roadways and utilities damaged by the heavy traffic of large dump trucks over the period of the project. My concern is directed to the recommended solution. This solution would have the loaded trucks going East on D Road (the most logical route) to the new site.

As a director with the Central Grand Valley Sanitation District, I wish to note that we have a clay pipe sewer system crossing under and adjacent to D Road.

I understand from our engineer and other directors, who know more about the system that the traffic dictated by the recommended solution would severly damage those segments of the system.

Interuptions in the traffic flow due to repairs and/or replacements being made to the system would cause problems for the project. The cost of those repairs and/or replacements must also be identified with the project.

If the recommended solution is selected, this problem needs to be addressed in advance to avoid delays and subsequent problems. I would be happy to coordinate efforts to avoid the many problems which could result from this situation.

Sincerely,

CENTRAL GRAND VALLEY SANITATION DISTRICT

Randy Booth

Randy Booth
Board of Director

DEPARTMENT OF THE ARMY
SACRAMENTO DISTRICT, CORPS OF ENGINEERS
650 CAPITOL MALL
SACRAMENTO, CALIFORNIA 95814

REPLY TO
ATTENTION OF

May 9, 1986

Regulatory Section

Mr. John G. Themelis, Project Manager
Uranium Mill Tailings Project Office
Department of Energy
5301 Central Avenue, N. E.
Suite 1700
Albuquerque, New Mexico 87108

Dear Mr. Themelis:

I am responding to your request to review the Department of Energy's Draft Environmental Impact Statement (DEIS) for remedial actions at the former Climax Uranium Company uranium mill site. The project site is located adjacent to the Colorado River, in Grand Junction, Mesa County, Colorado.

The DEIS has been reviewed as it relates to Corps of Engineers' projects, investigations, navigation and regulatory responsibilities. The proposed action does not conflict with Corps of Engineers' projects for flood control, navigation nor water resource developments in the immediate area.

Based on our review, we have determined that a Department of the Army permit under Section 404 of the Clean Water Act will be required for alternatives 2 - 5.

Alternative 2 - A Department of the Army permit will be required for construction of the six foot thick rock armor layer below the ordinary high water elevation of the Colorado River. If the waste-water retention basins are to be located below ordinary high water or in wetlands adjacent to the Colorado River, a Department of the Army permit will be required.

6.20.1 Alternative 3 - 5 - Similarly for these alternatives, if the wastewater retention basins are located below ordinary high water or in wetlands adjacent to the Colorado River, a Department of the Army permit will be required. Additional information, such as stream names and crossing locations for the disposal sites, is necessary to ascertain whether this activity can be authorized under a nationwide permit or will require an individual permit.

Remedial action, independent of the alternative chosen, will adversely impact approximately 40 acres of wetlands adjacent to the Colorado River. Proposed mitigation for these anticipated impacts consists of recontouring the excavated area to create an environment conducive to the re-establishment of wetland and
6.16.1 riparian plant species, revegetation of the impacted area, and the selective use of soil-erosion controls. A Department of the Army permit will be required for the discharge of fill material (soil) and the subsequent backfilling and recontouring.

We appreciate the opportunity to comment on the DEIS. Should you have questions regarding these comments, please contact Gary Davis of our Grand Junction office, 764 Horizon Drive, Room Number 211, Grand Junction, Colorado 81506-8719, telephone (303) 243-1199. We look forward to working with you in the near future.

Sincerely,

Art Champ
Art Champ
Chief, Regulatory Section

Copy Furnished:
Mr. Joe Crocker, Mesa County Floodplain Administrator, 1000 South Ninth Street, Grand Junction, Colorado 81501

14

U.S. Department of Housing and Urban Development
Denver Regional Office, Region VIII
Executive Tower
1405 Curtis Street
Denver, Colorado 80202-2349

MAY 5 9 59 AM '86

April 30, 1986

Mr. John G. Themelis
Project Manager
Department of Energy
5301 Central Avenue - Suite 1700
Albuquerque, N.M. 87108

Dear Mr. Themelis:

This is in response to your letter of March 21, 1986, transmitting the Draft Environmental Impact Statement (DEIS) for Remedial Actions at the Former Climax Uranium Company Uranium Mill Site, Grand Junction, Mesa County, Colorado.

6.21.1 Your DEIS has been reviewed with consideration for the areas of responsibility assigned to the U.S. Department of Housing and Urban Development. This review considered the proposal's impact on urbanized areas. Subject to the mitigative measures outlined in Section 5.20 of the DEIS, we find this document adequate for our purposes.

If we can be of further assistance, please contact Mr. Howard Kutzer, Regional Environmental Officer, at (303) 844-3102.

Sincerely,

for Robert J. Matuschek
Director
Office of Community
Planning and Development

15

MESA ROCK COMPANY
Phone 242-8046
2301 River Road
Grand Junction, CO 81505

Mr. John G. Themelis
Project Manager
Uranium Mill Tailings Action Project
U.S. Department of Energy
Albuquerque Operations Office
5301 Central Avenue, N.E., Suite 1700
Albuquerque, New Mexico 87108

Dear Sir:

Pertaining to your remedial Action, Cleanup of the contaminated material at a mill site and associated vicinity properties in Grand Junction, Colorado. I am writing in reference to item R.P. 4.2.4. in the Draft Environmental Impact Statement where it is stated that the only boulder material available is 25 miles S.W. of Whitewater, which is not necessarily true, as we have a permitted Rock Quarry 14 miles S.W. of Whitewater, which contains fines, coarse and boulders which would be suitable for cover material. Our Permit numbers are County MCM 84-29; State

6.7.1 M-84-001. We feel that material should come from existing permitted sources rather than opening new ones. Please send us the specifications for the cover material.

Thank You,

John Schmahl
May 12, 1986

Dominguez Dam PROJECT
P. O. Box 1330
Grand Junction, Colorado 81502

May 7, 1986

Mr. John G. Themelis, Project Manager
Uranium Mill Tailings Remedial Action Project Officer
U. S. Department of Energy
Albuquerque Operations Office
Office of Public Affairs
P. O. Box 5400
Albuquerque, New Mexico 87115

Re: Grand Junction Uranium Mill Tailings Site Meeting Held at City Hall, Tuesday evening, May 6, 1986.

Dear Mr. Themelis:

Thanks for the opportunity to have a representative appear at your mill tailings meeting. I was unable to be present, but one of our advisory members, namely, M. O. Brown, former chairman, did appear.

6.17.1
Table 6.2

We are definitely against the Cheney Reservoir site, 18 miles southeast of Grand Junction for relocation of mill tailings. Said site would be near the proposed Dominguez Reservoir on the Gunnison River. The Dominguez is a 26 mile reservoir to supply clean power, municipal and industrial water, and recreation to a continual growing population in the Grand Junction area which is entirely dependent on reservoir storage water for its water needs. The Dominguez Project has been under study by the Bureau of Reclamation since authorized by Congress in October 1972 (Public Law 92-577).

The Mesa County Dominguez Reservoir Advisory Council are seven water entities which have authorized the Mesa County Commissioners to be the single entity to purchase and sell water out of the Dominguez Reservoir. The seven water entities, which have acted by their respective boards are Town of Whitewater, Town of Palisade, Clifton Water District, City of Grand Junction, Redlands Power and Water District, Ute Water Conservancy District and Town of Fruita.

We set out the foregoing information to reflect local support and certainly, the last thing we need is to contend with a relocated mill tailings site in the reservoir area.

Mr. John G. Themelis
Page 2
May 7, 1986

Table 6.2

As far as remedial action options are concerned, we would prefer,

1. (2) Stabilization of all the contaminated material at the Grand Junction site.

2. (5) Relocation of all contaminated material by truck to the Two Road site 33 miles Northwest of Grand Junction, where the material would be stabilized.

We ask to be kept appraised of the Department of Energy action.

Yours truly,

MESA COUNTY DOMINGUEZ RESERVOIR ADVISORY COUNCIL

Louis Brach

Louis Brach, Chairman
2209 North 1st Street
Grand Junction, Colorado 81501

LB/jm

P. S. According to Department of Energy News Fact Sheet, it appears that you have already made up your mind to use No. 3.

cc: Lawrence Aubert, 211 Country Club Park Drive, Grand Junction
James Brown, 550 Palmer, Delta, CO 81416
M. O. Brown, 628 26 Road, Grand Junction, CO 81506

April 7, 1986

17

DOE; Albuquerque:

Re Grand Jct Meeting

April 22 will address these remarks about Climax Tailings regards six alternatives.

#3 Cheney Reservoir — handsdown geology best - quite flat - low rainfall

"D" Road less traffic and rural

I travelled D road daily ~~daily~~ 1958-1970 when I worked for Climax as a chemist. I worked USBM, Rolla Mo 1944-1955 as a chemical analyst.

Table 6.2

Hope you can get started on this without further delay.

Willis Strong

Palisade, Colorado

18

Palisade, CO.
May 28, 1986

U. S. Department of Energy
P.O. Box 5400
Albuquerque, New Mexico 87115

Re: Grand Junction Uranium Mill
Tailings Site

Gentlemen:

6.11.2, Table 6.2 — I have reviewed the six alternatives you have proposed and I would like to go on record as objecting very strongly to Alternative No. 3 - the Cheney Reservoir site. Locating the mill tailings at this site would have a very detrimental effect on a very nice area along Kannah Creek and could pose health hazards for those living there.

6.9.2 — The site is too close to the residences in that area. Quite a few of the residents in the Kannah Creek area are using well water at this time, and if the present contract with Grand Junction to furnish domestic water is not renewed, there may be more wells drilled in the future. I do not feel that there is any assurance that this site would not contaminate the underground water supply in this entire area.

6.8.1 — The Cheney Reservoir site is at the foot of Grand Mesa and in the immediate drainage area. There is runoff of surface water as well as considerable underground water in this area and it would be a very poor choice of locations.

6.6.4 — With regard to transporting the tailings to the Cheney Reservoir site, I feel the impact on our roads would be too extensive. The impact on D Road of that much traffic, with school busses loading, etc., would be very dangerous.

6.6.9 — The road is not designed for that heavy truck traffic and the damage to the road itself would be very expensive. Are provisions made to repair the road or rebuild it when the project is completed?

6.5.8 — Alternative No. 5 would create a very hazardous traffic problem. If the tailings are to be placed at the Two Road site, I feel they should be transported by train. We have not had available a cost statement as to why it would be so much more expensive to transport the tailings by rail.

6.6.4 — If there is included, as there should be, a cost on the repairs to our State and County roads, it doesn't seem that it should be that much more expensive to construct a rail spur to deposit the tailings at the Two Road site.

Thank you for your consideration.

Sincerely yours,

Doris Butler

Doris Butler
3681 F Road
Palisade, CO. 81526

May 30, 1986

U.S. Department of Energy
Albuquerque Operations Office
Office of Public Affairs
P.O. Box 5400
Albuquerque, NM 87115

Gentlemen,

In regards to the "Remedial Actions at the Former Climax Uranium Company Uranium Mill Site, Grand Junction, Mesa County, Colorado - Volume 1 - Text, I would like to have the following statements taken into account before a decision is made regarding the Uranium Mill Tailings Removal.

6.9.3 Table 6.2 I oppose the tailings dump site at Cheney Reservoir. There is alot of underground water in the Kannah Creek area. The water level is very high in some places. There is also more rainfall in this area than in the Two Road area. To put a tailings dump where contamination could get into the drinking water for this area and other areas of the Grand Valley is outrageous. If the dam goes into construction on the Gunnison River near Whitewater, it could contaminate the entire reservoir.

6.15.1 The Two Road Disposal Site would be in a less populated area. There are quite a few families living within a two mile radius of the Cheney Reservoir Site.

6.6.15 If the railroad was used, there would not be the traffic congestion that would result from truck transportation of the tailings. Since the railway system runs near the Two Road Site, the cost would be far less than constructing a rail system all the way from Whitewater to Cheney Reservoir.

6.6.10 The congestion in Whitewater, if the tailings were trucked to Cheney Reservoir, would impact the area in an unfavorable way. It's already difficult to get onto the highway from "The Whitewater General Store" or the main streets of Whitewater.

6.9.8 Are there any guaranties that the present site can be totally decontaminated, or that contamination hasn't already seeped into the ground underneath the present site to a degree that it can't be totally decontaminated? If not, why contaminate even more Land and expose even more people?

6.25.4 The best alternative, in my opinion, would be to stabalize the present site, make it into a park is permissable, and to open the river along the area to fishing.

Sincerely,

Cindy Richardson

Cindy Richardson
3558 GS Road
Whitewater, CO 81527

BOARD OF
Mesa County
Commissioners

Mesa County Courthouse
544 Rood Avenue
P.O. Box 20000-5010
Grand Junction, Colorado
81502-5010

R.W. (Bob) Holmes
District No. 1
244-1605

Dick Pond
District No 2
244-1604

Maxine Albers
District No. 3
244-1606

Gordon Tiffany
County Administrator
244-1603

20

May 30, 1986

John G. Themelis, Project Manager
Uranium Mill Tailings Remedial Action Project
U.S. Department of Energy
Albuquerque Operations Office
5301 Central Avenue N.E.
Suite 1700
Albuquerque, New Mexico 87108

Dear Mr. Themelis:

Enclosed please find the UMTRAP Grand Junction Task Force's comments on the <u>Remedial Actions At The Former Climax Uranium Company Uranium Mill Site Grand Junction, Mesa County, Colorado Draft Environmental Impact Statement.</u>

We look forward to continued interaction with the DOE on this project.

Sincerely,

R.W. Holmes

Robert Holmes
Chairman
Grand Junction UMTRAP Task Force

Neither the DEIS or the additional information supplied by the DOE adequately addressed the following critical issues:

- -Assumptions for costing rail transportation
- -Assumptions for costing truck transportation
- -Capital Costs that could be incurred by State and Local Governments (i.e. road maintenance)
- -Reclamation Plans for both the mill site and the repository site
- -Lack of contingency plan if program funding is either delayed or unavailable
- -Excessive air quality impacts and mitigation of these impacts
- -Potential for co-location of LLRD
- -Vicinities properties issues

DEIS does not contain sufficient analysis of comprehensive impacts. It does not rate and rank the alternatives adequately. The Task Force believes that direct costs should not be the sole factor in selection of the preferred alternative.

Table 6.2 | Further, we feel that the data presented do not support the preferred alternative of DOE. It is unacceptable to say that the Cheney site is the preferred alternative when the transportation information is flawed. Based on the information available the Task Force prefers the 2 Road site.

1

SPECIFIC COMMENTS ON DEIS

DOE ALTERNATIVE SELECTION PROCESS

Because of the lack of information contained in the DEIS and provided to the Task Force during the comment period, the Task Force was hampered from making a conclusive recommendation. Based on the information available, the Task Force favors 2 Road as the repository site, and wishes further analysis of transport. The following are specific comments on the alternatives:

6.2.1 Alternative I (No Action) is not acceptable because it is located in an urban area and lies within the 100 year floodplain. It does not address the potential health hazards associated with uranium mill tailings.

6.8.5 Alternative II (Stabilization On-Site) is unacceptable because it is located in an urban area and lies within the 100 year floodplain. There is general community support for the removal of the tailings pile from the urban area. It does not eliminate the need for the transportation of large
5.4.16 amounts of fill and cover materials. In addition, it would be difficult to meet EPA standards for radon emission and groundwater protection.
Alternatives III & IV (Cheney by Truck = III, Cheney by Train/Truck = IV)
6.15.2 The Task Force does not want either of these alternatives to be considered the preferred alternative. The Cheney site is in close proximity to the population of the Kannah Creek area. This area has current and on-going value for rural residential development. The location of the repository
6.14.1 will affect scenic and recreational values, including the proposed Dominguez Canyon Reservoir.

6.9.5 In addition, the DEIS indicates that there is a shallow water table at the Cheney site and that the surface water at Cheney is moderate to high.
6.8.2 There are also intermittent streams and an irrigation system near the site. This raises questions for long term water quality which were not given suitable weight in the evaluation process.

6.2.20 There are potentially greater impacts of increased traffic over the entire haul route to the Cheney site than there are for the 2 Road site, (see Transportation Section). Lastly, Appendix C (pp C-22 through 25)
6.4.13 shows the Cheney site as having the lowest site suitability score.

6.6.20 Alternatives V & VI (2 Road by Truck = V, 2 Road by Train/Truck = VI) Traffic impacts of Alternative V are high within the urbanized area of Grand Junction.

6.5.8 Impacts on Mesa County road construction and maintenance are high at the 2 Road site, potentially as much as $2,000,000. These costs have not been considered.

IMPACTS

Air Quality

6.10.8 The Grand Valley is a non attainment area for suspended particulates. The impacts of this project on other activities in the community, because of air quality standard violations, have not been considered. Further, the

potential affects on residents near the mill site, haul routes or near repository sites have not been fully discussed.

6.10.8 Serious deficiencies exist within the DEIS concerning air quality impact assumptions. Calculated impacts from any of the transport alternatives seem irrational and far exceed any comparable estimates. Specifically, particulate emissions from the transport alternatives are between 4.5 and 6.5 times the total area source estimates modelled for the Grand Valley, (PEDCO 1978). The possibility of 1,266 TONS of uncontrolled mill tailings emitted from the Grand Junction site is incomprehensible and must be invalid. In addition, air pollution control measures, practices, and equipment have been superficially treated and must be addressed in adequate depth before serious consideration can be given to modelled predictions or emission estimates.

Land Use

6.17.4 This project will impact uses adjacent to the mill site, haul routes and the disposal sites. Property values will be adversely affected in some cases. The final reclamation and use of the mill site is undetermined.

Population and Employment

5.15.1 Any increase in population of employment can be absorbed by the local economy and infrastructure at the present time.

Transportation

6.6.1 Transportation routes and associated impacts are of primary importance to the Task Force. The transportation mode and cost appear to be the driving force in the DOE selection of the preferred alternative. The DEIS proposes the Cheney site by truck transport as the cheapest alternative; the data presented do not substantiate this conclusion. The DEIS has numerous deficiencies regarding transportation:

6.6.13 1) An all rail alternative to the 2 Road site was not considered.

6.6.1 2) Assumptions on transportation costs (truck via a via rail) are inconsistant, e.g. purchase of rail cars vs. contractor supplied truck.

6.6.1 3) Transportation costs seem to be only a function of miles traveled. Other factors such as travel time, road grades and traffic conflicts were not considered.

6.5.8 4) Additional road maintenance and improvement costs that will be placed on State and local governments were not specified.

For County roads, the costs are estimated to range from $500,000 - $2,000,000 depending on the repository and route.

6.6.1 5) No alternatives for truck haul routes were presented. Examples include possible closure of the 5th Street bridge and conflicts with school bus routes.

6.21.1 6) Lack of analysis of impacts of on-going access to the repository for vicinity property tailings disposal.

6.5.11 7) No information on ownership, location, and right-of-way costs for access road to Cheney site.

6.6.23 8) Accidental Spill Contingency Plan is not included.

6.6.2 9) Accident rate methodology is unclear.

6.6.3 10) No analysis included on impacts on tailings transport on tourism and area image.

Accidental Spills

6.6.22 Potential accidental spills of tailings are not projected. Also, clean-up procedures are not described.

Costs

6.5.7 Cost information is a key element in this DEIS because it plays a significant role in selection of the repository site. The DEIS has numerous deficiencies regarding costs:

1) Special traffic considerations were not costed out, for example:

a) transit time expense.

2) transfer costs (i.e. rail to truck) are not documented.

3) data on rail cost were not included.

4) costs for decontamination of properties adjacent to haul routes not considered.

5) lack of information on liability issues.

6.5.8 6) costs of upgrading and maintenance of local and state roads are not included.

VICINITIES

There are three issues pertaining to the vicinities project and the DOE compound that need to be addressed in the final EIS. They are:

6.21.1 1) On-going disposal at depository of vicinities property tailings.

6.2.6 2) Potential disposal at repository of DOE compound tailings.

6.21.1 3) Disposition of vicinities sites not slated for clean-up.

CO-LOCATION ISSUES

6.2.6 The task force understands that the DOE is not considering the co-location of a low level radioactive waste disposal site (under the Rocky

Mountain Compact) as an issue to be addressed by this EIS. However, unless the DOE or the Colorado Department of Health can confirm co-location will not take place in the future, the Task Force is compelled to require that the cumulative, long-term impacts of such co-location be addressed in this EIS.

6.2.6 The likelihood of co-location of the Grand Junction DOE mill tailings and/or of the Denver Radium Waste should be analyzed. Again, the cumulative, long term impacts of such co-location be addressed in this EIS.

Such consideration of cumulative impacts has been a part of many previous Environmental Impact Statements covering oil shale projects in this region, even though these projects were not simultaneously built.

The Task Force has taken the formal position that the Rocky Mountain Compact low level radioactive waste disposal site shall not be located in Mesa County.

ISSUES TO BE ADDRESSED

The Task Force required that the following issues be addressed:

6.6.13 1) An alternative using rail exclusively to the 2 Road site should be presented and analyzed in detail in the final EIS. Included in this analysis should be the addressing of the potential for use of the old Uintah Railway alignment and the possible future uses for the Sheridan and Fruita coal mine complexes.

6.6.13 2) More detailed comparative analysis between alternatives, (including the all rail to 2 Road alternative).

6.5.8 3) Disclosure of costs to local governments for each alternative (focus on road upgrading, maintenance; and tourism).

6.6.1 4) Potential impacts on residents near the mill site, haul routes, or depository site should be addressed.

6.10.11 5) Total inclosure of all loading and unloading operations (with negative air pressure practiced along with HEPA filtration) should be addressed.

6.10.6 6) Include proposed air pollution control measure to comply with air quality standards.

6.6.19 7) Disclose impact of mill tailing losses during transport to private, commercial and public property.

6.4.5 8) Disposition of mill site (final reclamation; future use; radiation levels) should be analyzed.

6.5.7 9) Full disclosure and comparison of cost for truck/rail and rail modes.

6.5.7 10) Other transportation factors (i.e. travel time) must be analyzed and included in route cost.

6.6.4 | 11) Develop alternate haul routes to avoid identified problem areas.

6.21.1 | 12) Detail impacts of on-going disposl of vicinity property tailings.

6.5.11 | 13) Provide information on ownership, location, and right of way cost for access road to Cheney site.

6.6.23 | 14) Include process for local input and approval of Transportation Route Plan and Accidental Spill Contingency Plan. These plans are to be developed before contracts are awarded.

6.6.2 | 15) Explain accident rate methodology.

6.25.3 | 16) Clarify liability issues involved with this project. Provide information on Price-Anderson. (Federal Indemnification Act).

GRAND JUNCTION UMTRAP TASK FORCE

Geno Saccomanno - 778 26 1/2 Road

Patrick A. Gormley - P O Box 1508

Vic Thompson - 815 6 Road, Mack 81525

Dale D. Story - 526 36 3/4 Road, Palisade 81526

Larry McNeese - P O Box 128, Palisade

Gordon Haller - 445 N. Mulberry, Fruita 81521

Robert W. Holmes - 1660 Delores

Louis A. Grasso, Jr. - 2115 Grand Avenue

Jackie Moran - 623 26 Road

Reford Thebold - 2806 Mesa Avenue

Connie Albrecht - P O Box 8297, Durango

John Thomas - 3073 McKenna Court

Paul Klite
1450 Logan Street
Denver, CO 80203
303-832 7558
May 23, 1986

Manager, Uranium Mill Tailings Project Office
Department of Energy
5301 Central Aveune, N.E., Suite 1700
Albuquerque, N.M. 98108

Dear Sir:

These comments are in response to your Draft EIS for the Climax uranium tailings in Grand Junction, CO.

In your concern for the isolation and stabilization of the tailings, you have neglected to give full consideration to the final aesthetics of your proposals.

6.4.11 Since both the parent and relocation sites will be with us for centuries, the visual impact of the end result must be completely addressed and optimized. Unfortunately, your proposals (DEIS, Vol. 1, Fig. 3.1, 3.2, 3.3) are ugly and unimaginative - efficient but unaesthetic. When humans view these sites (and who can forsee how populations and their viewing angles will change over the decades) they must not be confronted with the tomblike monumental structures you propose - foreboding and depressing monstrosities guaranteed to shrink the soul. This would be a tragic and shortsighted result for such an enormous undertaking.

Fortunately, aesthetic options for final configurations are feasible and would be compatible with environmental and engineering requirements. Aesthetic strategies could include:
1. sculptural contouring for visual interest
2. use of plant materials as texture and color
3. creating visual focal points to reduce the overall impact.

FRIENDS OF THE EARTH
P.O. Box 728
Palisade, CO 81526
(303) 464-5329

May 31, 1986

Mr. John G. Themelis
Project Manager
Uranium Mill Tailings
Remedial Action Project
U.S. Department of Energy
Albuquerque Operations Office
5301 Central Avenue, N.E., Suite 1700
Albuquerque, New Mexico 87108

Dear Mr. Themelis:

The following comments are submitted for Friends of the Earth and the Uncompahgre Group of the Sierra Club on the Draft Environmental Impact Statement on REMEDIAL ACTIONS AT THE FORMER CLIMAX URANIUM COMPANY URANIUM MILL SITE GRAND JUNCTION, MESA COUNTY, COLORADO.

6.2.4 The Draft EIS on the Grand Junction site is notable from the standpoint of clear and readable narrative. The appendices were useful and provided excellent technical information on the whole. Generally the DEIS exhibits a positive and significant evolution of analysis over earlier documents on the UMTRAP program and the Grand Junction site. However, there are significant discrepancies and factual gaps involving comparative analysis of alternatives; the selection of the preferred alternative; and post-remedial actions. These analysis deficiencies, combined with our concern about the environmental impacts of the probable implementation of the Grand Junction UMTRAP are the focus of our comments.

COST BIAS

6.5.9 We had hoped to make an unequivocal recommendation on a repository site vis a vis the preferred alternative. This proved difficult given the data and analysis deficiencies. Furthermore, cost estimates appear to drive the selection of the preferred alternative. Previously, when stabilization on site appeared least expensive the Department of Energy expressed interest in this alternative. As the greater costs of this option became apppárent in terms of attempting to meet EPA standards, repository selection became more of a priority. So this DEIS includes the Cheney repository site as the preferred alternative. DOE and State Health Department personnel have also made repeated public references which indicate a bias towards selection of Cheney as a repository due to its supposed less cost. While cost is certainly a major factor to be considered, the DEIS does not do a fair and comprehensive comparison of the costs of the alternatives, and

6.5.9 omits factoring in some of the environmental problems associated with the Cheney alternative.

NO ACTION ALTERNATIVE

6.2.7 The no action alternative has been, and continues to be, unacceptable to our organizations. The environmental community, both locally and nationally, supported the passage of the UMTRA because of our belief that uranium mill tailings constitute a significant public health hazard and environmental contaminant. As cited in the DEIS the no action alternative would not meet the intent of Congress.

STABILIZATION ON SITE

6.3.1 The stabilization on site alternative is also unacceptable to our organizations. The DEIS cited that an estimated 20 cancer deaths would result from the SOS, which is 10 times greater than disposal at a repository site. For this reason alone it can never be elevated to a preferred alternative or proposed action. The DEIS assumes that an engineering solution for SOS is possible, ie. that it could meet radon emission standards and gradually reduce the aquifer and surface water pollution. In our view, there simply is not the data in the DEIS to support this conclusion, nor is there experience with stabilization of such a massive uranium mill tailings site on which to base such an expectation. Lastly, the majority of citizen input during the NEPA process to date has supported the removal of the tailings to a repository. Reasons cited have dwelled on the health impacts of allowing such a site in a population center to concerns with contamination of the Colorado River; property values; and community image. In sum, the stabilization on site alternative should not even be considered a serious and viable alternative.

CHENEY VIS A VIS TWO ROAD REPOSITORY

Table 6.2 Regarding the other major alternatives in the DEIS (Nos. 3, 4, 5 and 6) which essentially present a choice between two repository locations, Cheney and Two Road, with 2 transport options for each, we believe the Two Road site is superior from the standpoint of environmental and geotechnical considerations, and possibly from the standpoint of transportation route impacts.

6.4.13 The Cheney site is not an unacceptable site strictly on the basis of environmental and geotechnical standards; however, Two Road is a better site than is Cheney. In the state's preliminary report on potential repository sites Two Road was rated the highest of all the sites based on geotechnical considerations. In the DEIS (see appendices page C-24) the other similar sites in the vicinity of the Two Road clearly rate higher on environmental criteria; geotechnical attributes; and land use and property issues. The major advantage of Cheney over Two Road seems to relate only to cost, since the supposed costs of the Two Road site are higher due to its further distance from the millsite.

Our observation of local factors confirms the DEIS analysis that a repository at Cheney would have significantly more impacts than a repository at Two Road due to:

6.15.3 ***proximity to population at Kannah Creek, farm/ranch operations, and recreation areas on the Gunnison River.

6.9.5 ***presence of shallow aquifer on the site itself

6.8.3 ***larger drainage area, plus more intermittant streams and irrigation ditch near site

6.6.5 Additionally, the transportation impacts are probably greater for Cheney than for Two Road. While the cited accident rate is less for the Cheney site using truck (see DEIS Text pages 200-201) the statistics may be misleading because the accident rate is heavily based on miles travelled. The Two Road alternative would require a greater number of miles travelled, however local observation and experience would indicate that safety and congestion issues are much higher for the Cheney haul route, in considering the entire route impacts, specifically the much higher traffic volume and congestion on D. Rd, 32 Rd., and turning across traffic twice on Highway 50. Utilizing the accident rate for "all roads" or "county roads" to estimate accidents for the Two Road vicinity is an overestimate, because of the isolation and virtual lack of traffic on Two Road.

6.15.2 The Cheney area is likely to experience more long-term residential growth due to current county growth patterns, utility corridors and the proximity of private lands than is the Two Road site which is buffered by a great deal of federal land. Even assuming the initial repository meets EPA standards, there is more potential for long-term institutional problems with the Cheney site, e.g. radon exposure to nearby residents; impacts on ground and surface water, and greater risk of vandalism and disturbance due to population. These issues should be more fully analyzed in the FEIS.

6.3.2 In sum, the comprehensive long-term impacts, as well as possibly some short-term impacts, are clearly greater at the Cheney site. Unless these impacts can be conclusively disproven by new data, we request that in the Final EIS:

1) Two Road be elevated to the preferred alternative

2) Cheney be retained as suitable alternative

6.3.2 3) Additional alternatives be added--that is, all-rail transport to both Cheney and Two Road be fully analyzed

Should the FEIS retain Cheney as the preferred alternative than we request that more analysis be included on:

6.4.9 1) engineering and mitigation measures to ensure long-term protection, ie. up to 1000 years

6.9.6 2) protection of water resources at Cheney, e.g. repository liner; thicker cover; more site protection

6.6.4 3) specific traffic congestion problems associated with various segments of the proposed haul route by truck

6.10.9 4) greater efforts to mitigate air quality impacts to residents at Kannah Creek, Whitewater and neighborhoods along hauling route.

TRANSPORTATION ISSUES

6.5.1 We are essentially in concurrence with the comments submitted by the Mesa County UMTRAP Advisory Task Force regarding specific route problems and associated costs for local governments. Once again we are cncerned that costs for transport are driving the decision-making process for the ultimate site selection ie. truck transport to Cheney has become the alternative due to assumed lower costs. Although logic assumes that Cheney would be less expensive due to less distance this is not completely substantiated in the DEIS, as exhibited by:

6.5.2 a) Specific transport considerations do not appear to be costed out--eg. time in transit expense as well as total miles travelled. Because of congestion on D. Rd, 32 Rd., and Highway 50 transport time to Cheney may be equivalent or greater in cost than to Two Rd.

6.4.7 b) The energy, fuel, and water consumption amounts as cited in DEIS Appendix Pages B-92-93-94 for the alternatives are not significantly different.

6.5.3 c) Many of the construction costs associated are not widely variable, see table B. 5. 15 in the DEIS Appendix.

d) Many of the initial site preparation, removal, construction, and reclamation costs are the same for Cheney and Two Road sites.

6.5.4 e) Where construction costs do vary there is no explanation. For example, why are repository site preparation costs and supervisory services higher for truck/rail alternatives?

6.4.8 f) There is similar anticipated employment for the repository alternatives.

6.5.5 g) The transfer of tailings from rail to truck has been cited as double-handling with greater attendent costs, but is not well documented in the DEIS.

6.5.6 h) Rail costs per mile or load are not documented.

6.5.8 i) All-rail alternatives are not included so true cost-comparison is incomplete.

6.5.8 j) In supplementary information given by the DOE (Themelis letter to Mesa County Commissioners 5/14/86) the rail vis a vis trucking costs do not appear to be based on same criteria. Additionally, the rail alternative to Two Road was not included as requested.

6.6.31 k) Accident rates, including fatalities, are significantly lower for truck/rail transportation. Rail only accident rates are probably even lower and should be included.

The burden of proof is on the final EIS to make a fair and comprehensive comparison of the costs of the Cheney and the Two Road sites, especially in regards to incorporation of the rail only option for both sites. Therefore, we request the FEIS to:

1) Rectify the data/analysis deficiencies noted above.

2) Include more comprehensive documentation and comparative analysis of costs of repository sites at Cheney and Two Road.

6.2.3 3) Develop a point rating system in the FEIS for the alternatives which includes geotechnical, environmental, socio-economic, and transportation concerns as well as costs.

6.6.5 4) Utilize same criteria for evaluation of all transport modes, including all-rail.

6.6.22 5) More fully address accidental spills--who is responsible for cleanup; general clean-up procedures; effectiveness of cleanup procedures.

6.6.16 6) Include data on rail system use for Vitro site, including traffic accidents and spills; costs; and air quality impacts.

AIR QUALITY

6.10.1 Our organizations consider the temporary air quality impacts to be one of the most negative environmental impacts associated with the proposed removal of the tailings. The projected air emissions are totally unacceptable even for a conservative, worst-case analysis. Since the Grand Valley currently violates federal

6.10.1 air quality standards for particulates and constitutes a non-attainment area, as noted in the DEIS, any additional major particulate source is a significant problem. However, the effects of UMTRA-generated air emissions on the nonattainment area and on the Category I designation (similar to PSD Class I) for the Colorado National Monument have not been fully addressed.

6.10.2 Impacts from air quality deterioration on local residents are not fully addressed. Projected deaths and other impacts are based on the general population, and do not consider the numbers of

6.11.8 residents affected, or the degree to which they would be affected, depending on their proximity to the millsite, proposed haul routes, and the repository site.

6.10.3 Barrow pit-related emissions are dismissed as unimportant and therefore excluded. Historically, gravel mine operations in the area have been important sources of particulate emissions. Any barrow area, with associated traffic, being utilized as proposed at the 32 & C 1/2 area or Fruita area, could increase the anticipated air quality impacts.

6.10.6 Air pollution control measures are barely mentioned and appear to be limited to covered trucks and use of water for dust control.

6.11.9 In order to do an adequate treatment of the one of the most important environmental impacts of the project, the DEIS must include the following analyses:

1) Effects of additional radon and particulates on local residents near millsite, along haul route, and the repository site.

6.10.3 2) Inclusion of barrow pit and associated transport emissions in projected emissions.

6.10.4 3) Installation of air quality monitoring stations where needed, eg. at the repository, since current stations are few and far between.

6.10.5 4) Comparison of air emissions for all-rail alternatives.

6.10.6 5) Discussion of full range of air pollution control measures, including but not limited to: covered transfer stations with filtration systems; shutdown of operations during inversion periods; and utilization of "reasonably achievable" technology.

6.10.7 6) Quantification of air emissions reduction based on longer timeframe for construction phase, eg. 4 years vis a vis 3 years.

LOW-LEVEL RADIOACTIVE WASTE COLOCATION

While the DOE has repeatedly said that this EIS will not consider the possible co-location of other low-level radioactive materials with the Grand Junction UMTRAP repository, it remains an issue of grave concern to our organizations. The Denver radium waste, the Rocky Mountain compact low-level radioactive waste site, and the uranium mill tailings at the Grand Junction DOE compound are all low-level wastes which could potentially be co-located at the UMTRAP repository at some point in the future.

6.2.6 The FEIS must consider the additional impacts of co-location of any and all of the above waste sources with the UMTRAP repository. Specifically, the cumulative, longterm impacts of such colocation must be addressed. There is a precedent for such analyses under NEPA, and such consideration of cumulative impacts from separate projects was included in EIS's for oil shale projects in the region, even though the projects were being built by different companies at differing times in the future.

EPA STANDARDS, RECLAMATION, ETC.

We are concerned about the proposed cover and several other related issues with the repository, as well as the disposition of the millsite. A great deal of soils, geologic, hydrologic and engineering information is presented involving both the millsite and repository design. We have not received the requested opinions on the DEIS from independent experts at this time; we may submit later comments should we determine there are major problems with repository issues. However, in our review of the DEIS we noted the following problems:

6.4.1 a) Alternative materials and depths of cover were not considered. Even though the calculations for depth of cover may have an error factor of three such errors appear to be excluded from any calculations of cover depth. Assurances are made, but inadequate proof is provided, that the assumed 5 foot clay will meet the EPA 1000 year standard. The cover should be thicker to provide additional insurance of radon control.

6.9.1 b) The permeability and potential failure of the compacted layer, with possible contamination of the groundwater at the Cheney site, is not fully considered; please do so in FEIS.

6.4.2 c) Throughout the DEIS it is mentioned that the 5-foot cover could be reduced to 3 feet by first depositing the most highly radioactive material from the millsite on the bottom of the repository, with less radioactive material over it assisting in the retardation of radon. Not only is this difficult to ensure on a consistent basis

6.4.2 given quality control of contractor work (which is not addressed) it also is not conclusively proven that it would adequately reduce radon to meet the 1000 year timeframe.

6.4.3 d) Site characterization may not be adequate due to the depth of drilling. Additionally, the Two Road site is not as well

characterized as the Cheney site; it will need further studies if it is elevated to the preferred alternative.

6.4.4 e) The background radiation tests are meager, and it's unclear if the proposed tests were done at the Cheney site. It will be difficult to determine if EPA standards are being met if the background radiation information is not detailed.

6.22.3 f) Postremedial action radiation monitoring and institutional controls for both the reclaimed millsite and respository are not considered and must be included.

6.4.5 g) More detailed information on the ultimate radiation levels, reclamation condition, and potential uses of the millsite must be included.

6.4.6 h) Alternative construction and reclamation programs must be considered, in order to reduce air quality impacts and impacts on the Colorado River. Please give serious consideration to staging or phasing of the project, as well as staged-cell reclamation.

6.21.2 i) Continued hauling of vicinity properties tailings to the eventual repository site, probably for years after the millsite is removed, is not fully addressed. Reclamation and other pertinent problems arising from this situation should be addressed.

6.2.5 The EPA's intent during rulemaking and adoption of standards, was an affirmative requirement that UMTRAP sites meet the 1000 year timeframe. It does not allow DOE to use the 200 year timeframe as a maximum goal, or for any case it sees fit, or to reduce the cost of the project. The final EIS must provide more assurance that the 1000 year timeframe can be met by the proposed action. In order to prove the DOE is seriously attempting to fulfill this requirement the above issues must be thoroughly addressed. We are especially interested in seeing more alternatives on cover design included. For further references detailing environmentalist's concerns with DOE's proposed cover design, see:

Shuey, Chris and Dr. Terry Sewards, COMMENTS ON THE U.S. DEPARTMENT OF ENERGY'S ENVIRONMENTAL ASSESSMENT OF REMEDIAL ACTION AT THE SHIPROCK URANIUM MILL TAILINGS SITE, SHIPROCK, NEW MEXICO Southwest Research and Information Center, Albuquerque, New Mexico, August 21, 1984. (See pages 29.)

Yuhnke, Robert, et.al. COMMENTS BY THE ENVIRONMENTAL DEFENSE FUND ON REMEDIAL ACTION AT THE FORMER VANADIUM CORPORATION OF AMERICA URANIUM MILL SITE AT DURANGO, COLORADO. Environmental Defense Fund, Boulder, Colorado, January 11, 1985. (See pages 1219.)

Thank you for consideration of these comments.

Sincerely,

Connie Albrecht

Connie Albrecht
Colorado Representative, Friends of the Earth

John Thomas

John Thomas
Radioactive Waste Issues, Uncompahgre Group, Sierra Club

May 24, 1986

Mr. John G. Themelis, Project Manager
Uranium Mill Tailings Remedial Project
U.S. Dept. of Energy
5301 Central Avenue, N.E.
Albuquerque, N. M. 87108

Ref: Environmental Impact Statement, Former Climax Tailings Removal Proposal at Grand Junction, Colorado, DOE/EIS-0126-D

I did not have an opportunity to attend the public hearings held in Grand Junction in May as I was out of town. I have just reviswed the two documents at library and wish to make the following observations/comments.

Following comments relative to Alternative # 3.

6.10.10 This alternative would move the tailings east on D Road to 30 Road, thence south to U.S. 50 and on to Cheney Site(if it is chsoen) Page 193 shows this to mean 209 truck trips daily on this route (D road) At no place did I run across any statement that the trucks hauling tailing would be covered with physical barrier to prevent particulates from blowing out along the proposed transporation route (or back along U.S. 50 into Gd Jct. Something of this nature needs to be spelled out in final EIS.

6.6.18 I could not find either, any reference as to when the hauling would occur. Does your plans call for daytime hauling only - 8a.m. to 5 p.m.???? Would there be any other hours of hauling?

6.6.17 I could find no refence as to sise of trucks used for hauling tailings -- 5 yd? 10 Yd or what? Do you intend to have all trucks secured at night so they will not move sbout the community with their radioactive dust? This should be covered in your final EIS as these vehiclas will become radioactive.

6.6.9 You vagely mention raod damage but offer no funding to repair same. You state that improved employment etc will benefit the community and thus pay for road damage. Wrong. You should spell this out as property owners might have to foot the repair bills for the road for a government project.

6.17.4 During the 34 months of this project, property owners along the D and 32 road route would see their property values decreasa drastically and make it nearly impossible to sell if the need occurred. Why should these people have to suffer financial loss?

6.11.7 Your health statistics projections on cancer to the body varies from .058 to .512 for altsrnative 3 for persons along the transportation route. How do you know? Are you famislir with esch individual that lives along this route to know their invidual risk? Despite many years gained knowledge on radio-activity, the government still does not know or makes guesses. On Page 127 you list five main avenues for radioactive exposure. (1) inhalation of radon, (2) direct gamma radiation, (3) inhalation or ingestion of windblown radioactive

particulates, (4) ingestion of plants grown in radioactive soils, and, (5) ingestion from water from radioactive soils.

6.11.6 On Page 140 it says - "persons along transportation route may be exposed to gamma radiation from passing vehicles hauling tailings". Besides this we could expect to inhale windblown particulates from passing trucks (there is 8.3 MPH winds in valley according to your data and U.S. Weather Service. Those of us who grown crops along route may ingest it that way too?

6.11.10 Alternative # 4 - train and trucking to Cheney site (if chosen) would cost more but endanger far less of the population aven though it will cost more.

6.11.4 Alternative 6 - Two Road site 0 by train and truck would be safest for all thought more costly to accomplish. When peoples lives are at stake, cost should be considered acceptable rather than an excusa to pick cheapest method. Your death projects mean nothing because the government always denies its action harmed anyone or caused deaths to the public.

Sincerely,

Gilbert R. Wenger

Gilbert R. Wenger
392 30 Road
Grand Junction, Co. 81504

City of Grand Junction. Colorado 81501
250 North Fifth St..

May 30, 1986

Mr. John G. Themelis, Project Manager
Uranium Mill Tailings Remedial Action Project Officer
U. S. Department of Energy
Albuquerque Operations Office
5301 Central Avenue, N.E., Suite 1700
Albuquerque, New Mexico 87108

RE: Draft Environmental Impact Statement
Remedial Action at the former Climax Uranium Mill Site
Grand Junction, Mesa County, Colorado

Dear Mr. Themelis:

Enclosed are comments submitted on behalf of the City of Grand Junction with respect to the DEIS published March, 1986, referenced above. These comments reflect the staff analyses from the Planning and Public Works Departments as well as the position of the Grand Junction Planning Commission.

6.5.8 In general, we feel the DEIS is well done and organizes the information in a clear and manageable format. We would, however, like to see a more detailed costs analysis of the various alternatives, since cost emerges as a major consideration. The rail-truck alternatives were estimated to cost approximately twice the truck alternatives, yet no supporting information was given on the cost breakdown.

6.6.9 The repair of road damage from the truck alternatives is extremely important to the jurisdictions, such as the city, who are responsible for road maintenance. The DEIS fails to address this issue.

We hope our comments will be helpful in revising the DEIS. If you would like to discuss any of the questions or issues raised, please contact Don Newton, City-Engineer, or Greg Flebbe, Senior Planner, to arrange a meeting.

Sincerely,

J. Don Newton
City Engineer

Greg Flebbe
Senior Planner

JDN:pb

Att:

cc: City Manager
City Council

It is the position of the City of Grand Junction that the tailings pile should be removed from the Grand Junction Site and that this removal must be accomplished in a manner that will best protect the health, safety, and welfare of the public. Those alternatives that involve the trucking of tailings from the Grand Junction Site to either the Cheney Reservoir or the Two Road disposal site are considered unacceptable in that they pose the greatest negative impacts to air quality, noise levels, traffic volume and safety, and transportation infrastructure. In order of their acceptability to the City, the six alternatives presented in the DOE/DEIS are discussed below.

1. DOE Alternative 6. Disposal at the Two Road site with train and truck transport. (City's preferred alternative.)

6.6.8 Transporting the tailings material from the Grand Junction site by train would result in the fewest negative impacts, particularly with respect to public safety and condition of City streets.

2. DOE Alternative 4. Disposal at the Cheney Reservoir site with train and truck transport. (Acceptable to City.)

3. DOE Alternative 3. Disposal at the Cheney Reservoir site with truck transport. (Not acceptable to City.)

6.6.4 Trucks leaving the Grand Junction site would travel north on 15th Street and leave the city limits at D Road. Although currently in good condition, 15th Street was not designed or constructed to carry the proposed volume of truck traffic and would deteriorate as a result.

Trucks returning to the Grand Junction site would enter the City limits on Highway 50 at B 1\2 Road; the City maintains that portion of the proposed route along Highway 50 between Santa Clara and Noland Avenues. The northbound bridge over the Colorado River is an old steel truss structure scheduled for replacement by the State Highway Department in 1988. The existing bridge deck is in poor condition and very difficult to maintain with current traffic volumes; the additional truck traffic resulting from this alternative could damage the deck beyond repair before the bridge replacement date. Furthermore, an alternate route would be necessary during construction of the new bridge.

6.6.4 The portion of the return route which, from Highway 50, turns east on Noland Avenue, south on 7th Street, and east on Struthers Avenue does not make sense. Turning east onto Struthers Avenue from Highway 50 would be more direct and would involve two fewer turns at intersections. Additionally, Noland Avenue, 7th Street, and Struthers Avenue are all in fair to poor condition and will not support the proposed truck traffic.

4. DOE Alternative 5. Disposal at the Two Road site with truck transport. (Not acceptable to City.)

Trucks leaving the Grand Junction site would travel north on 9th Street to Ute Avenue. Ninth Street is in poor condition and is scheduled for reconstruction in 1987; the new pavement section would have to be substantially increased in thickness to accommodate the increase in truck load applications, at considerable additional cost.

6.6.4 The five-way intersection at Highway 6 & 50, Highway 340, and 1st Street is the highest traffic accident location in the City, averaging 30 accidents per year. Routing an additional 418 trucks/day through this intersection would considerably increase traffic congestion and accidents here. This issue is not addressed in the DEIS.

Another hazardous location along this route occurs at the curve where the southbound lanes on 1st Street turn onto Pitkin Avenue. Because of the pavement being superelevated in the wrong direction, several trucks have overturned trying to negotiate this curve.

Given the existing City street configuration, a suitable trucking route for the Two Road site cannot be identified.

5. DOE Alternative 2. Stabilization at the Grand Junction site. (Not acceptable to City.)

6.4.15 The City is studying the feasibility of the redevelopment of the 5th Street (Highway 40) and Colorado River area; the tailings pile is included within the easterly limits of this study area. The City's intent is to: a) improve the appearance of a major ingress to the City; b) develop a high quality, rail-oriented industrial park; and c) develop the river park concept for both active and passive recreational uses. The removal of the tailings is a vital component in the implementation of this concept.

6. DOE Alternative 1. No action. (Not acceptable to City.)

General Comments

6.6.9 — 1. Under none of the DOE Alternatives are road maintenance and funding thereof adequately addressed. Several City streets on the proposed truck routes are not capable of supporting the truck load applications being proposed. The cost to repair and, where necessary, reconstruct roadways damaged by truck transportation should be included as a direct cost in each alternative.

The proposed method of providing funding for road maintenance through road and use taxes paid by trucking contractors to the State of Colorado (Section 5.13.2) is far from adequate to pay for road damage expected to result from the trucking alternatives. A fair economic comparison of truck alternatives to train-truck alternatives cannot ignore the direct costs associated with road maintenance and reconstruction.

6.4.15 — 2. To reduce the costs of reclamation of the Grand Junction site after removal of the tailings, we recommend creating a lake in a portion of the site. This would reduce the total amount of fill that would have to be imported, and the lake would provide a recreational amenity for future park users. The remainder of the site would be revegetated as described in the DEIS.

6.4.14 — 3. The existing tailings pile now acts as the easterly portion of a flood control dike along the Colorado River. Reconstruction of the dike after removal of the tailings pile has not been addressed in the DEIS.

Specific Comments

6.15.4 — 1. (4.12.1 Population, p. 161). The Grand Junction planning department has been regularly tracking population trends for the urban area. The attached Data Sheet and Technical Report #3.1 more accurately reflect the true population of the area.

2. (4.12.4 Housing, p.117). Technical Report #1. Vacancy Survey has been included for your information.

6.12.2 — 3. (4.12.5 Government Structure, p. 118). Grand Junction has a <u>seven</u> member city council.

6.12.3 — 4. (4.12.6 Community Services, Water Supplies, Waste-water, and Public Utilities, p. 119). The City of Grand Junction supplies water to approximately <u>19,000</u> people, the service area is smaller than the City.

6.12.3 — The newly completed facility (waste-water) has a capacity of <u>12.5</u> million gallons per day, may be expanded to <u>25.0</u> million gallons per day and is currently operating well below capacity.

6.24.12 — 5. (4.12.7 Transportation Networks, Regional Networks, p. 120, third paragraph, third sentence). ... and a passenger train that runs <u>daily</u>.

6.17.3 — 6. (5.7 IMPACTS ON LAND USE, ((and related sections)), P.168). The Mesa County Board of County Commissioners has also adopted the Parks and Recreation Master Plan for the Colorado River Park System. The Grand Junction Tailings removal is a critical factor in the development of this park system.

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

ER 86/573

JUN 10 1986

John G. Themelis, Project Manager
Uranium Mill Tailings Project Office
U.S. Department of Energy
5301 Central Avenue, N.E., Suite 1700
Albuquerque, New Mexico 87108

Dear Mr. Themelis:

We have reviewed the draft environmental impact statement for Remedial Actions at the Former Climax Uranium Company Uranium Mill Site, Grand Junction, Mesa County, Colorado.

6.3.4 We agree with the decision to move the uranium mill tailings pile from the Grand Junction site. The present location in a meander path on a low alluvial terrace of the Colorado River (p. EI-1 and F-6) places the pile in jeopardy. Ultimately, high discharges of the river would remove all or part of the pile. Removal of the tailings pile will also alleviate the problem of material washing or leaching into the river, potentially impacting fish and wildlife resources. Also, removal of the tailings pile and restoration of the riparian zone would complement proposals by Mesa County and the City of Grand Junction to acquire a greenbelt along the Colorado River floodplain.

6.20.2 Relocation of the tailings to a site on public land would require more than Bureau of Land Management (BLM) approval of a land withdrawal application (Page 205). The withdrawal application that has been filed with the BLM is for a five-year administrative land withdrawal. During that five-year period, DOE may initiate construction of the disposal site. However, before any relocation of uranium mill tailings takes place, the DOE must seek and be granted a permanent withdrawal through Congress. Such action is necessary to ensure that the contaminated lands will not revert to BLM for management. Your schedule should include the necessary time to obtain this legislation.

6.20.3 It has been suggested (p. 206) that this site could also serve the State of Colorado or the Environmental Protection Agency (EPA) for disposal of low-level radioactive wastes from other cleanup actions, perhaps (under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). The withdrawal application currently being processed by the BLM is for site study and preparation of an uranium mill tailings site under UMTRA. Should the State of Colorado or EPA wish to locate a low-level radioactive material disposal facility with an UMTRA facility agreements will have to be negotiated with the agency then responsible for the land.

6.2.8 The disposal of radioactive material at the Cheney Reservoir site was not addressed in BLM's existing planning documents. Neither the existing management framework plans (MFPs) nor the final resource management plan (RMP) for the Grand Junction Resource Area contemplated this type of land use; therefore, the planning documents must be amended before the withdrawal action can be approved. BLM intends to rely on this EIS

6.2.8 as NEPA compliance for the required MFP/RMP amendment if the Cheney Reservoir site is selected; the EIS should contain an explicit statement to the effect both the MFP/RMP amendment and action on the withdrawal application are part of the Federal action analyzed in the document.

The EIS should include a discussion concerning the source and location of water needed for project purposes at the Cheney Reservoir site and other sites. If surface waters are to be used, this may adversely impact wildlife resources and mitigation may be required.

6.8.6 The statement indicates that a deep well may be drilled at the Cheney Reservoir site to obtain water for equipment decontamination, compaction, and dust control. The statement should estimate the quantity of water needed for these uses and evaluate impacts of the withdrawal on the aquifer and on surrounding wells. The manner of deep-well construction and the probable location with respect to the tailings should be described. Disposition of wash water from the construction vehicles should also be addressed.

6.7.1 The document states that the Unaweep Canyon borrow site will be selected in consultation with the Bureau of Land Management (BLM). BLM's land use concerns in Unaweep Canyon include: The Palisade Outstanding Natural Area, The Palisade Wilderness Study Area, the Unaweep Seep Research Natural Area (RNA), the Unaweep Canyon Visual Resource Management (VRM) Class II designation, possible designation of Unaweep as a "scenic area" (or something similar) by Mesa County/U.S. Forest Service/BLM, and a big game winter range. The Unaweep Seep Resource Natural Area and its associated aquifer are fragile and need protection. A borrow site and/or quarry would not be considered compatible with VRM Class II criteria. There are several privately owned borrow pits and rock quarries in Unaweep Canyon; these existing sites should be considered for possible use.

6.4.17 The radon protection cover and the rock armor overlying it are both dependent on a stable tailings pile for their structural integrity. Cracks in either can foster erosion and escape of radon. The DEIS mentions the compaction of the relocated tailings and we presume that standard engineering practices will be followed. However, the design considerations for the Cheney Reservoir alternative do not mention any means by which the transported tailings will be tested for compaction or for similar parameters related to the pile's function as a foundation. Also, the discussion of Tailings Pile Construction (p. B-38), does not specify any means of confirming that the expected compaction and absence of extensive layers of slimes are actually the case. Assurance of a stable foundation is critical to each alternative.

6.16.1 A primary concern with Alternatives 2-6 is the potential for loss of 40 acres of riparian habitat. This impact may occur because of the need to remove contaminated vegetation and topsoil adjacent to the tailings pile. However, we have learned that a radiological survey was recently conducted in the project area and that only a small (about 1/4 acre) area may be contaminated in excess of the Environmental Protection Agency standards. If this information is confirmed and included in the EIS, it is possible that loss or disturbance of riparian habitat could be insignificant. If so, it may only require limited revegetation of disturbed areas with native species to offset losses of wildlife values. We recommend that loss of riparian habitat be avoided where possible. Riparian habitat, which is relatively scarce in the project area, is probably the most diverse and important

6.16.1 wildlife habitat in the State. In accordance with Fish and Wildlife Service (FWS) mitigation policy (Federal Register 46, No. 15, January 23, 1981), we have established that the riparian habitat in the project area is classified as Resource Category II. This means the FWS mitigation goal would be no net loss of in-kind habitat values. Unavoidable losses of riparian habitat in the project area would require in-kind replacement of habitat value.

6.16.8 Conclusions should not be made regarding the degree of impact to federally listed fish species until completion of the new biological assessment currently being done by the FWS in coordination with the Department of Energy. Our specific comments cite two instances (p. 167, paragraphs 3 and 4) where statements imply that such conclusions have already been reached.

6.16.2 Although no primary impacts will occur at Cheney Reservoir, secondary impacts as a result of human disturbance during construction and increased access after construction may be significant and should be addressed in the EIS. This area is a valuable wetland area, particularly for waterfowl and shorebirds. Sandhill Cranes utilize the reservoir during their migration and thus there is potential for Whooping Crane utilization also.

Sincerely,

Bruce Blanchard, Director
Environmental Project Review

Enclosure

Specific Comments

6.12.5 Page 8: Orchard Mesa Middle School (enrollment 619) is across the Colorado River and 1,500 feet from the current tailings site.

Page 13, Table 1.1: Archaeological Resources and Historic Resources should simply be labeled "Cultural Resources." "Archaeological" does not mean prehistoric per se; historic resources may also be archaeological.

6.18.1 The table incorrectly states there would be no impacts. Under the single heading Cultural Resources there will be impacts under alternatives 3, 4, 5, and 6. Impacts for alternatives 1 and 2 and vicinity properties cannot be addressed until National Register of Historic Places (NRHP) determinations are made for historic properties. The statement (or lack thereof) on impacts is misleading. Regardless of mitigation, cultural resource values will be directly and/or indirectly affected. Under Section 106 of the Natural Historic Preservation Act of 1966 (PL 89-665) consultation with the State Historic Preservation Officer determined that sites at the Cheney Reservoir Site and the Two Road site are eligible for inclusion on the NRHP list.

6.4.18 Pages 23 and 24: The magnitude of each alternative of the project should be better defined. Examples: provide the size of the waste water retention ponds; type of fencing and how much.

6.17.5 Page 24: Unidentified borrow area in Unaweep Canyon may or may not be on BLM lands. This should be clarified.

6.4.15 Page 31, Grand Junction Site: The revegetation of this site should include the reestablishment of at least 25 acres of riparian habitat. Cottonwood trees should be included in this revegetation effort. We recommend that all suitable areas be replanted to riparian species, the excavated areas left as fresh water ponds, and the area dedicated as a green belt.

6.8.6 Page 31, Cheney Reservoir Site. Include a discussion concerning the source of water needed for stabilization of the tailings pile, dust control, and the truck wash station. We recommend that water not be taken from the Whiting ditch, since there may not be sufficient water for McDonald and Cheney Reservoirs. These two reservoirs, although seasonal, provide a much used and needed water source for wildlife in this desert area.

6.8.7 Page 38, Two Road Site. This section should discuss the source of water needed for stabilization of the tailings pile, dust control, and the truck wash station. This site may have a better source of water than at the Cheney Reservoir site since the Government Highline Canal waste water enters West Salt Creek near the Two Road Site. This water may be available during the irrigation season for use at this site.

6.7.2 Page 44, 3.2.8 Borrow sites. It is not sufficient to merely refer to "material." The specific soil, rock or deposit which will come from a specific site should be identified. This is important because the physical properties necessary for the specified uses, i.e., radon cover, erosion cover, fill material and capillary break, are diverse and the properties are use-specific.

6.3.5 | Page 49: The rationale used to eliminate East Salt Creek and the 6 & 50 sites is very brief and should be expanded.

6.24.13 | Pages 50-54, 149-150, 173-174. Define and quantify "large" increases in truck traffic in terms of percent increase.

6.4.19 | Page 61, 4.2.4. The number of cubic yards of borrow material should be included here.

6.19.1 | Page 73, Figure 4.8. The pattern for the Precambrian schists, gneiss, etc, is appropriate for sedimentary rocks only, not metamorphics. Standard patterns for metamorphics are available and should be used.

6.8.6
6.4.20 | Pages 78-83, 153-157: Identify the source of the water, its proposed uses, and the effects on senior water rights. Identify the proposed method for keeping the tailings wet during transit. Define low permeability. Give the materials of which the capillary barrier will be constructed.

6.24.17 | Page 81, paragraph 1, second sentence: Change "Perdy" to "Purdy."

6.16.3 | Page 93, paragraph 2: Pronghorned antelope are believed to use the Cheney Reservoir area for kidding.

6.16.4 | Page 93, paragraph 3: Substitute the word "low" for the word "limited." No place has an unlimited diversity of biota.

6.16.3 | Page 93, paragraph 5: The statement is correct but underemphasizes the size of the pronghorn population. The reduction of the area of pronghorn range here should become an identified prediction in Chapter Five (pages 164-165) and mitigation proposed.

6.16.5 | Page 94, paragraph 1. We question that sharp-tailed grouse occur and nest at this site. It is more likely that chukar partridge occur and nest at this site. Further investigation of the question of the sharp-tailed grouse is necessary. Use of the common name "marshhawk" should be replaced with "northern harriers." The name "meadow lark," however, should be one word with a modifier, "western meadowlark."

6.16.6 | Page 95, paragraph 1: Some misconception is apparent in the communication with BLM (1985b). Uinta Basin hookless cactus has a high chance of occurring on the Cheney Reservoir site. Occurrence would require that the Cheney Reservoir area and the transportation corridor be surveyed and cleared for the Uinta Basin hookless cactus prior to any surface disturbance. There are no populations of Uinta Basin hookless cactus in the Unaweep Canyon known by BLM (1985b). Spineless hedgehog cactus is the species of Unaweep Canyon, although none have been reported to BLM from the western side of the Unaweep divide.

6.16.7 | Page 95, paragraph 2: The subspecific epithet should be spelled the same as the specific one (Speyeria nokomis nokomis). The location of the borrow site in relation to the butterfly's habitat should be given.

6.16.8 | Page 95, paragraph 3. The Colorado squawfish does occur in the Colorado River at Grand Junction. By letter dated October 30, 1985, the Fish and Wildlife Service (FWS) provided Jacobs Engineering Group, Inc. with Colorado squawfish data for this reach of the Colorado River. These data show that between 1982-1984 nine radio-tagged Colorado squawfish moved through the reach of Colorado River adjacent to the inactive uranium mill tailings. These data should be utilized for drawing conclusions made in the final EIS regarding the presence of Colorado squawfish in the project area.

6.16.9 | Page 96, paragraph 2: Cranes forage in the desert and can be expected to use the range at both the Two Road site (lower probability) and at the Cheney Reservoir site.

6.16.10 | Page 96, paragraph 6. We believe the black-footed ferret surveys completed by Biota Research and Consulting, Inc. should be reported in more detail. The diurnal surveys found four ferret-like diggings which justified the completion of nocturnal surveys. While the nocturnal surveys were negative in result, it is conceivable that ferrets have utilized the area but were not present in the area while the nocturnal surveys were ongoing. It is important to recognize that completed ferret surveys are considered valid for only 1 year. Consequently, we recommend that the Department of Energy should specify that surveys will be completed within 1 year of project construction to determine the presence or absence of ferret evidence. The conclusion made in the DEIS that this species "does not occur" seems inappropriate in view of the ferret-like diggings observed and in the numerous unconfirmed ferret sightings reported from the general area. A more appropriate conclusion is that the surveys "failed to document the presence of ferrets at the site."

6.16.10 | Page 97, paragraph 1. If the project will impact prairie dogs, black-footed ferret surveys will be required before disposal of the tailings occurs.

6.18.2 | Page 114, 4.11.2 and 4.11.3 and Appendix J: "Historical Resources" should read "Cultural Resources or Prehistoric and Historic Resources."

6.18.6 | There is a major flaw in the discussion of occupation of west central Colorado - the discussion here would greatly benefit from considering the concept of continuous occupation by hunter and gatherer groups as defined in Buckles' work on the Uncompahgre Complex. Recent C14 dates (Reported for the Sisyphus Shelter by J. Gooding; Sieber Canyon by Brian O'Neil; Gore Ranch by C. Wignal; and Indian Creek by Nickens) support the idea of occupation by hunting and gathering groups through the Formative stage.

6.10.12 | Pages 147-148, Table 5.5: The time values on this table are not defined. Specify day, week, month, etc.

6.16.10 | Page 165, paragraph 1. Prairie dog towns should also be considered as potential black-footed habitat. If prairie dogs occur at the Cheney Reservoir site, then the potential that black-footed ferrets may occur at the site should be considered until surveys demonstrate otherwise.

6.16.3 | This section and that of the Two Road alternative underemphasizes the two pronghorn antelope herds that will definitely be affected.

6.16.10 Page 165, paragraph 3. As previously mentioned, prairie dog towns also should be considered as potential black-footed ferret habitat.

6.16.1 Page 166, paragraph 3. We disagree with the statement on the last line of this paragraph, "These impacts are anticipated to be limited in scope." The loss of riparian habitat in the project area, and possible indirect adverse impacts on Colorado River aquatic habitat, is of significant concern. It may be impossible or very difficult to restore the 40 acres of riparian habitat if the area is stripped of all vegetation and the top layer of soil is removed. Also, the DEIS does not address the issue of how replacement soil would be retained on these islands in the event a flood occurred prior to reestablishment of permanent mature vegetation. It is very important that impacts on the riparian wildlife habitat be minimized by restricting clean-up efforts to only those areas contaminated in excess of Environmental Protection Agency standards.

6.16.11 Page 167, paragraph 3. Biological opinions are a consequence of formal consultation under the Endangered Species Act, initiated when lead Federal agencies make a "may affect" determination for federally listed species. The biological assessment prepared by the Department of Energy in 1983 concluded "no affect" to federally listed species. The FWS concurred with that finding, and consultation under the Endangered Species Act was appropriately terminated without a biological opinion. This paragraph correctly recognizes that because the project has significantly changed since 1983, compliance under the Endangered Species Act must again be satisfied by the Department of Energy. The FWS has been coordinating with the Department of Energy and the consulting agencies to identify those issues that should be addressed in the new biological assessment. Therefore, no conclusions (such as in the last sentence) should be made regarding the degree of impact to federally listed fish species until completion of the biological assessment (and following review of any necessary biological opinion).

6.16.11 Page 167, paragraph 4. Same as for paragraph 3. The DEIS should reserve conclusions regarding the degree of impact until all documents associated with the Section 7 process are completed.

6.16.2 Page 168, paragraph 1. The biological assessment prepared by the Department of Energy should evaluate potential impacts to whooping cranes associated with all aspects of the project, including transportation corridors and water use.

6.16.10 Page 168, paragraph 2. While black-footed ferret surveys have been completed at the Two Road site, it is likely that resurvey of this site for ferrets would be necessary prior to disposal.

6.17.6 Page 169, last paragraph: The removal of 80 acres from an oil and gas lease would result in higher drilling and development costs as directional drilling could be necessary. Higher drilling and development costs might result in limited activity and foregoing some oil and gas reserves. Should DOE acquire the subsurface mineral rights through legislative action, the existing leases may be terminated. Impacts from such terminations need to be identified and analyzed.

6.17.6 Page 170, fourth paragraph: Same as comment for page 169 above.

6.17.7 Page 170, third paragraph: The Colorado-Ute 345 KV power line is now in place and energized.

6.18.3 Page 175, paragraphs 1 and 2: In general, the document has neglected to address the indirect impacts generally associated with increased access, visibility, and visitation. Vandalism is generally a problem in these kinds of situations, and the Indian Creek area possesses numerous sensitive cultural resource sites.

6.18.4 Page 176, paragraphs 2 and 3: One eligible and one potentially eligible site would be affected by disposal. Data recovery and mitigation measures would be developed in consultation with the State Historic Preservation Officer and BLM. Haul routes need to be identified and inventoried for cultural resource values.

6.24.1 Pages 207 and 208: Repeated statements, such as "Remedial action workers would be exposed to above-background levels of radiation and the possibility of construction related accidents," imply these impacts would be the same for all alternatives. The Grand Junction site would most likely be different in the level of impacts offered, from the other two sites, because of reduced handling of materials. A summary of the differences should be presented.

6.16.1 Page 209, Mitigative measures included in all alternatives. There is no mention in this section of mitigation measures to offset the loss of riparian habitat. The FWS has established that the riparian habitat in the project area is classified as Resource Category II. We request that riparian losses be compensated by replacement of the same kind of habitat values.

6.18.5 Pages 210 and 211: Mitigation measures for cultural resources need to be identified.

6.16.10 Volume II, Appendices. We recommend that the completed black-footed ferret surveys be included in Appendix H.

6.4.21 Figure B.3.1 and B.4.1 in the Appendix of the Draft EIS should appear in the Final EIS along with appearing in the Final EIS Appendix.

6.18.6 Appendix J-4: "...disappearance of Formative Period brought a reemergence of nomadic, etc. . . ." This statement is not supported by the archaeological record. It would appear, based upon recent investigations, that the "nomads" never really disappeared. This section, like the EIS section, should be rethought.

6.18.7 Appendix J-3: Haul routes need to be inventoried for cultural resources.

6.18.4 Appendix J-3.3: Add to the first sentence, "and one site, an open lithic scatter, has been determined to be potentially eligible and will need to be tested." These sites, along with the other 12 identified in the report, would be affected by disposal. Mitigation measures would be developed in consultation with the BLM and SHPO.

6.18.3 Appendix J-3.3: Two Road Site. Increased accessibility and visitation of the site will indirectly impact cultural resource sites.

6.18.8 Appendix J-3.2: Cheney Reservoir. Second paragraph: "These sites would not be impacted by remedial action" should be omitted. Add instead, "These sites will not be directly impacted by remedial action, as they are outside of the designated disposal area. Indirect impacts to these and prehistoric sites in the area are anticipated (resulting from increased accessibility and visitation)."

6.16.12 Appendix H, Page H-3, Birds. Only three species of waterfowl are mentioned in this section. Other waterfowl species also use the riparian corridor adjacent to the Grand Junction project site. These species include common merganser, common goldeneye, wood duck, pintail, green-winged teal, bluewinged teal, cinnamon teal, redhead, and canvasback. In addition, the Canada goose is common at this site. At the Two Road and Cheney Reservoir sites, chukar partridges are occasionally found.

COLORADO DEPARTMENT OF HEALTH

Richard D. Lamm
Governor

Thomas M. Vernon, M.D.
Executive Director

June 5, 1986

Mr. John G. Themelis, Project Manager
Uranium Mill Tailings Remedial Action Project Office
U.S. Department of Energy
5301 Central Avenue, N.E. - Suite 1700
Albuquerque, N.M. 87115

RE: Grand Junction DEIS

Dear John:

We have reviewed the March 1986 Draft Environmental Impact Statement for the Mill Site at Grand Junction, Colorado. Our specific comments are provided in the attachments to this letter. Some of our general comments are summarized below. Included in this transmittal are comments from the Radiation Control Division, Air Pollution Control Division, and Water Quality Control Division of the Colorado Department of Health, the Colorado Geological Survey, the Colorado Historical Society, and the Colorado Department of Highways.

This document is quite comprehensive for a clean-up site. However, there are some areas of both the text and the Appendices that appear to be redundant, and we feel that editing and information consolidation would enhance this report and future documents of its kind. In addition to readability, there are some other basic concerns that should be addressed prior to release of the FEIS. These include the following:

1. The DEIS should further address the impacts which result from tailings deposits which now exist and the tens of thousands of tons of deposits that will be left in uncontrolled areas within communities of Mesa County. The existence of these contaminated deposits will continue to adversely affect land use, property values, and future development, and will lead to increased radiation exposures and costs in an effort to control the continual spreading of this contamination.

2. The technical feasibility of design alternative #2, Stabilization-on-Site (S-O-S) has not been demonstrated. The effects of river cutting forces and the possible persistence of contaminants in ground water at the Processing Site are critical concerns that have not been thoroughly addressed. Please see more detailed comments by the Colorado Geological Survey (attached).

4210 EAST 11TH AVENUE DENVER, COLORADO 80220 PHONE (303) 320-8333

3. The two feet of rock riprap/gravel proposed for the stabilized pile cap (all action alternatives) does not appear to provide sufficient protection of the radon barrier against plant and animal intrusion, desiccation, and freeze-thaw.

4. Data provided in the DEIS appear to indicate the existence of definable plumes of both molybdenum and selenium contamination in ground water beneath and downgradient of the Processing Site. The DEIS conclusion that uranium, ammonium, and other contaminants will be relatively rapidly flushed from the site (for Alternatives 3 through 6) needs to be further substantiated, and resulting impacts further discussed. (Please see below and specific comments of the Colorado Geological Survey.)

5. Air quality modeling performed by the DOE and provided in Section 5.2 indicates exceedance of the primary Total Suspended Particulate Matter Standard for each (action) alternative considered. Additional mitigative measures may be required during construction activities to limit particulate emissions to acceptable levels. Emission Permit applications to be submitted for both the Processing Site and the Disposal Site should reflect adequate control measures to prevent any significant (modeled) violation of the TSPMS.

6. No control measures have been identified for the abatement of excessive noise. Mitigative efforts and controls need to be incorporated into the FEIS and final RA plan to attenuate noise emission from the construction/excavation process and transportation corridors. Included in our comments is a list of specific measures which would assist in reducing noise impacts to the affected communities.

7. The Colorado Department of Highways, the Mesa County Planning Commission, the Grand Junction Task Force, and various individuals have expressed concerns about the proposed frequency of truck trips under Alternatives 3 and 5 and the resulting impacts to public safety and to the highways, including damage to roads. Specific mitigative efforts, safety improvements, etc., need to be further discussed with these agencies and included as appropriate into the final remedial action design.

8. Additional data should be provided to the State and to the Grand Junction Task Force on rail and road upgrading costs for Alternative 6, disposal at the Two Road site with train and truck transport, so that final State concurrence with the preferred disposal alternative can be most effectively accomplished.

If you have any questions regarding our review or if we may be of other assistance please contact me or Jon Luellen of my staff.

Sincerely,

Paul

Paul Ferraro
UMTRAP Program Manager
Office of Health Protection

PF/ms

cc, w/attachments:

Thomas Looby, OHP
Edward Hawkins, NRC/DEN

Comment #	Page	Paragraph	Comment
1	1	3 6.24.2	The last sentence is an oversimplification. Recommendation is to rephrase as: "Since 1971 a building permit gamma survey program has been in effect in Mesa County to help prevent the continued misuse of these tailings."
2	1	4 6.21.3	The estimate provided of 3465 properties to be formally included into the UMTRA Program and thereby require remedial action should be updated. A figure of 3977 was listed in a January 9, 1986 transmittal from the Department of Energy.
3	1	4 6.21.4	Privately paid-for remedial actions are also being performed by property owners in conjunction with the Mesa County Building Permit Survey Program. Over 800 such private tailings removals have been completed to date.
4	6	1 6.24.3	5th sentence - Recommend rephrasing as: "The tailings and contaminated material would be covered with an earth radon barrier and capped with other earthen materials for long-term protection against the disruptive effects of erosion, plant and animal instrusion, desiccation, and freeze-thaw/frost heave."
5	6	3 6.24.3	Ibid.
6	7	3	Ibid.
7	7	6.21.3	See comment #2.
8	8	2 6.24.4	5th sentence - Recommend rephrasing as: "Winds are most frequently from the southeast, or to a lesser extent from the northwest,..."
9	9	5 6.11.11	Exposures would increase under the no action alternative due to the continual spread of contamination. See also comment #2.
10	10	Table 1.1 6.11.12	Doesn't consider or include remedial action worker health from private tailings removals at vicinity properties. These removals will continue well into the future.
11	10	Table 1.1 6.11.13	The continued exposure due to the spread of contamination is not addressed in the Public Health column. See comments #37 and #86.

Comment #	Page	Paragraph	Comment
12	10	Table 1.1 6.9.9	Water Resources column doesn't address the effect on ground water at vicinity properties in alternative #1. There are thousands of tons of tailings around storm sewers, water lines and other utilities. See comment #48.
13	13	Table 1.1 6.17.8	Land Use is now affected and will continue to be affected by tailings on vicinity properties. There is a major effect in that it deters development, and threatens health and economics. It should be a factor for all alternatives.
14	13	Table 1.1 6.5.12	Costs are both real from a financial standpoint and perceived to result in injury to the image of the community. This is a factor especially in the no-action alternative but also all other alternatives as not all locations will be cleaned up. See comment #85.
15	16	2 6.21.3	See comment #2.
16	19	1 6.24.5	2nd sentence - Recommend rephrasing as: "...around Mesa County" vs. "around Grand Junction."
17	20	4 6.21.3	2nd and 5th sentences - See comment #2.
18	20	4 6.21.4	4th sentence - See comment #3. Add "over 800 properties have been decontaminated to some extent under the Building Permit Survey Program tailings removals."
19	20	4	6th sentence - Since the descriptions of vicinity property activities and impacts are virtually identical in this DEIS and the Environmental Assessment (EA) of Remedial Action at the Vicinity Properties Associated with the Former Climax Uranium Company Uranium Mill Site, Grand Junction, Mesa County, Colorado document, February, 1986 (draft), all comments on the DEIS relating to vicinity properties are also directed to corresponding sections of the EA. (See attached letter and comments.)
20	22	3 6.24.6	The tailings pile and vicinity properties would not remain in their present condition (because of this dispersion by wind, erosion, uncontrolled misuse by man,...).
21	23	3 6.24.3	5th sentence - See comment #4.
22	24	1 6.4.23	5th bullet - At a Value Engineering meeting in Albuquerque on March 21, 1986, proposed alternative measures were discussed for retarding surface flows and ground-water intrusion onto the site. One such proposal involved the excavation of trenches along the South and at least some portions of the east and west flanks of the tailings pile, backfilling of these trenches with low permeability clay materials, and constructing earthen berms above the existing ground surface. A system of this type, if supplemented with an appropriate downgradient well withdrawal system, may provide an adequate means of controlling induced flow (recharge) from the Colorado River, and would appear to be considerably less expensive than the proposed sheet-piling system. A test pit program to determine current infiltration rates of surface water and groundwaters onto the site from the river and from the east and west directions should be performed, and a detailed analysis of the feasibility of this design alternative developed, including necessary clay material properties and availability, volumes and locations of trenches required, and comparative cost estimates.
23	24	1 6.24.3	Last bullet - See comment #4.
24	30	2 6.24.3	See comment #4.
25	30	4 6.4.23	5th bullet - See comment #22.
26	31	1 6.4.22	5th bullet - Page 19 indicates that a significant volume of contaminated alluvium exists beneath the tailings (0.38 million cu.yds is estimated). Under tight restrictions, washing/separating of contaminated gravel and gravel/cobble facies and reuse of cleaned rock at the processing site may be economically attractive. Contaminated water from this washing operation could be treated in the waste-water treatment unit.
27	32	2 6.4.24	Other principal features affecting the long-term stability of the stabilized pile include animal and plant intrusion, desiccation, and freeze-thaw.
28	33	2 6.24.3	5th sentence - See comment #4.

Comment #	Page	Paragraph	Comment
29	35	Figure 3.4 6.4.25	Two feet of rock on top of 5'0" of compacted soil cover does not appear to offer sufficient protection of the radon barrier and the tailings (i.e. provide for long-term stability). See comment #28.
30	38	1 6.4.22	8th bullet - See comment #26.
31	39	4 6.4.24	See comment #27.
32	42	Figure 3.6 6.4.25	See comment #29.
33	46	2 6.21.3	1st sentence - See comment #2.
34	46	3 6.21.4	The 800+ private removals by property owners since 1972 should be noted. See comment #3.
35	47	8 6.21.6	Final condition - Nothing is noted about deposits now under structures that are not being removed, but could pose a problem if the existing structure was torn down and a new tighter structure was constructed over the old deposit. This type of deposit, and others not discussed in the DEIS indicate that the last statement made in this paragraph is invalid and should therefore be omitted. See comment #86.
36	48	1 6.21.6	As described in greater detail in comments #52 and #85 the impacts of large volumes of contaminated mill residues left within communities of Mesa County after the completion of UMTRAP needs to be further addressed. These deposits will not be stable for even 100 years as many are being disturbed today. Property owners will be impacted by the uncontrolled movement of the contaminated materials, both from an increase in exposure as the spread of contamination continues and from deflation in property values.
37	50	3 6.11.14	How was the estimate of 1010 cancer deaths in 1000 years from the radiation released at vicinity properties (under the no-action alternative) derived? Were increased levels of exposure due to the continual spread of contamination taken into account in this projection? Private tailings removals would also continue at vicinity properties, which would result in additional exposures to workers.

26

Comment #	Page	Paragraph	Comment
38	53	3 6.21.3	2nd sentence - This statement is inconsistent with information provided in other sections of this DEIS (e.g. Page 9, Section 1.4, paragraph 3).
39	53	4 6.11.11	See comments #2 and #9.
40	60	Figure 4.4 6.24.7	Township and Range of the Cheney Reservoir site should be indicated.
41	62	Figure 4.5 6.24.7	Township and Range of the Two Road site should be indicated.
42	69	1 6.8.13	It would be more correct to say "The channel morphology of the Colorado River adjacent to the site is island-braided. Recorded information indicates that the river has been stable at this location for about the past 100 years. Upstream and downstream...."
43	78	5 6.24.8	1st sentence - The Grand Junction tailings site, the alternate disposal sites, ...
44	79	3 6.8.8	3rd sentence - Recommend rephrasing as per sentences #1, 2 and 3, page E1-17, Section E.1.4.2.1. The current phraseology is misleading.
45	80	1 6.8.9	Schumm and Harvey's (1983) conclusion was that "the Colorado River is likely to change the position of its dominant channel through time and therefore lateral shift of the river is expectable at the site. The island-braided pattern of the river in the vicinity of each site would tend to confirm this." It may be appropriate to include this information here.
46	81	5 6.24.18	Recommend adding a phrase that "The washes on the site are occasionally incised to depths of five feet or more and some show steep banks indicative of rapid erosion." (cf. Section E2.4.2).
47	84	2 6.9.10	Two main components of ground water flow within the alluvium are described: [near the river, the flow is] "generally parallel to and in the same direction as flow in the river...Away from the river to the north, flow is more generally toward the river." Water level contour maps in the area of the processing site (Figures F.3.11 thru F.3.13) indicate that the prevailing groundwater

Comment #	Page	Paragraph	Comment
47 Continued	84	2 6.9.10	flow direction beneath the site is very sensitive to seasonal and yearly variations in runoff rates in the Colorado River. The iso-concentration contour map of uranium in alluvial groundwater, Figure 4.11, suggests that there may be intermittent components of ground direction from the river towards the site (e.g. during periods of high run-off). Potential changes in flow rates and directions of contaminated ground water migration caused by such episodes of periodic recharge from the river need to be assessed. What impacts, if any, would these changes have on the future geometry, location and duration of the existing plume and on possible future water use?
48	89	6 6.9.9	Large volumes - thousands of cubic yards - of tailings were used to bed utility lines, storm sewers, and in the lining of some irrigation ditches in Mesa County. All of these deposits have the potential to affect surface water run-off but more especially groundwater.
49	101	1 6.21.3	See comment #2.
50	101	2 6.21.5	The background value for radon daughter concentrations in the Grand Junction area is listed in the DEIS as ranging from approximately 0.005 to 0.007 WL (e.g. Section I.3.1). The average RDC value found in properties with structural contamination should therefore be expressed as a range from approximately 0.018 to 0.020 WL.
51	107	5 6.21.3	5th sentence - See comment #2.
52	109	2 6.17.9	The description of impacts on land use, values, etc. is incorrect. Since 1972 the State has performed in excess of 22,150 gamma radiation surveys on planned building sites in Mesa County and has discovered over 1270 tailings deposits in that effort. Over 810 privately paid - for remedial actions have been completed on those sites. This number represents the number of vicinity property remedial actions that would have had to have been addressed at considerably greater cost and effort by either GJRAP or UMTRAP had the Building Permit Survey program not

Comment #	Page	Paragraph	Comment
52 Continued	109	2 6.17.9	responded to this community need. This represents an impact on the community that the DEIS has not considered. The large number of removals that did not take place because the property owner couldn't afford the remedial action costs attests to the additional impact that tailings in uncontrolled areas of the county can produce. See also comments #36, #86, and our letter dated March 26, 1986 (copy attached).
53	115	3 6.18.9	The DEIS should note that one vicinity property to date, the Presbyterian Church (5ME4156), has been determined eligible for inclusion in the National Register of Historic Places. The proposed remedial activities were determined to have no adverse affect on the historical significance of the property.
54	117	5 6.12.6	The drastic reduction in energy industry activities circa 1981 has produced significant impacts on housing vacancy rates and values that are not described here.
55	123	Fib. 4.16 6.24.14	32 Road is mislabeled; State Highway (SH) 146 is now designated as SH 141; 29, 30 and 31 Roads do not cross the Colorado River.
56	127	3 6.24.15	2nd sentence - Recommend rephrasing as: "...truck trips would also be taken from the specific site to and from various commercial sand and gravel distributing sites, and/or the 32 and C-1/2 borrow site..."
57	128	5 6.23.2	Public attitudes - 1st paragraph - The Mesa County Building Permit Survey Program has also increased public awareness of the hazards associated with tailings, as have local lending agencies, realtors, etc....
58	140	1 6.24.11	The word "Gaussian" is mispelled.
59	140	7 6.11.15	The dose equivalent commitment from radon daughter exposures is not consistent with Appendix I, p. I-50. See also comment #112.
60	141 142	Table 5.1/ Table 5.2 6.11.16	Consistent with Section 1.4, estimates of excess population dose equivalent commitments should be presented for 4 year -, or longer construction periods.

Comment #	Page	Paragraph	Comment
61	144	Table 5.3 6.11.16	See comment #60.
62	145	3	Ibid.
63	146	1 6.11.12	Ibid; efforts to control residual deposits will result in continued exposures to remedial action workers (performing future tailings removals). Estimates should be provided of the projected health effects due to these exposures.
64	146	2 6.11.14	See comment #37.
65	152	6	Please see more detailed comments of the Colorado Geological Survey.
66	154	4 6.9.11	Aquifer recharge to the river at the mill site is discounted because of dilution-potential. However, it is enough of a surficial aquifer problem in the area that its contribution to river loading was sufficient to assign a damage value for downstream (F-154). This subject merits further discussion at this point.
67	157	1 6.8.10	Remedial action at vicinity properties could affect surface waters. See comment #48.
68	157	4 6.8.9	See comment #47.
69	158	5 6.24.19	3rd sentence - "...and would stabilize near 8.8 to 52 pCi/l after approximately <u>100</u> years."
70	158	5 6.9.12	The predictions of possible maximum concentrations of uranium in the shallow ground water for the stabilization-on-site alternative - 8.8 to 52 pCi/l, to 39 to 235 pCi/l after 100 years-suggest that uranium and other plume contaminants could persist in the local ground water for several hundreds of years. Excavation activities at the processing site could also result in (an) additional pulse(s) of contamination being introduced into the ground water environment. What is the time table for natural clean-up of this ground water system? The future behavior of the current suite of contaminants should be modelled in more detail.
		6.9.13	2nd sentence - What direction(s) is(are) considered downgradient? See comment #47.

Comment #	Page	Paragraph	Comment
71	160	3 6.9.14	The mixing cell model does not take into account geochemical retardation effects and does not specifically include dispersivity. Incorporation of these assumptions could greatly increase the time required for natural cleanup.
72	160	5 6.9.15	It is stated that current levels of contaminants in the Mancos Shale will persist into the future. It is noted on pages 83 and F-49, however, that the Mancos Unit is locally absent approximately 0.5 miles west of the pile. What effect will this hydrologic connection between the alluvial aquifer and the Dakota Sandstone have on the possible eventual contamination of the Dakota aquifer and consequent future spreading of contaminants into the groundwater system?
73	161	3 6.9.16	The DEIS does not characterize the attenuative capacity of the silts and clayey sediments at the Cheney Reservoir site. The sorptive properties of materials to be used in the construction of the low permeability layer (liner) and of the surrounding soils at the Cheney site should be quantified.
74	162	2 6.9.9	Remedial actions at vicinity properties have the potential to affect ground waters. See comment #48.
75	169	1 6.17.4	Last sentence - Consistent with comments #13, 14, 36, 52, 77 and 86, it is suggested that the land value of parcels surrounding the site are noted as being <u>currently deflated</u> by the presence of the tailings pile.
76	169	3	3rd sentence, 2nd part - Is incorrect. See previous comments on impacts on land values.
77	171	3 6.21.6	This section does not take into account contaminated deposits left in uncontrolled areas. The last sentence is incorrect and fails to acknowledge the effort provided by the Building Permit Program.
78	171	3 6.21.3	See Comment #2.
79	171	3 6.21.7	The two-months disturbance time referred to here is not consistent with the one-month estimate provided in Sections 5.8.3 and 5.17.

Comment #	Page	Paragraph	Comment
80	176	1;3 6.14.2	The visual impacts of a 35 feet-above-grade rock covered pile will probably be greater than is stated in the dEIS. Potential long-term impacts on scenic and cultural values/resources of these areas should be further described.
81	177	3 6.18.3	The proposed access road to the Cheney site may subject this area of abundant cultural resources to vandalism. The DOE needs to address vandalism and a determination of effect and a testing/mitigation plan must be developed for the four sites listed (in consultation with SHPO).
82	177	4 6.18.4	The DEIS needs to be changed to reflect that there are two cultural resources rather than one within the Two Road site area. A determination of effect showing how avoidance of these two sites is to be accomplished has not been completed. This must be done in consultation with the BLM and the SHPO. See attached comments from the Colorado Historical Society.
83	195	3 6.24.16	2nd sentence - The improvements on State Highway 146 (32), now designated SH 141, are now complete and are located north of the D Road. The Colorado Department of Highways has no improvements planned for the segment of SH 141 between D Road south to Highway U.S. 50.
84	195	4 6.6.26	As indicated in the attached letter from the Department of Highways (dated May 20, 1986), significant road damage can be expected on SH 141 heading south after crossing the bridge over the Colorado River. Table 5.13 indicates a relatively low total weighted rating for this road. In addition, as noted in meetings in Grand Junction on May 6, 1986 and May 28, 1986 the Mesa County Planning Commission, the Grand Junction Task Force, and the Mesa County Engineering Department have concerns with the proposed use of county roads which have not been adequately addressed in the DEIS. Included in these concerns are impacts resulting from noise, traffic congestion, public safety (e.g. D Road is a narrow two-lane road, has no shoulders, and is a school bus route), and road up-grading/ maintenance costs.

Comment #	Page	Paragraph	Comment
84 Continued	195	4 6.6.27	Last sentence - Funds for road maintenance are provided to Mesa County by the State of Colorado according to the number of miles of open roadway. There is no direct application of road use tax or other truck use income to Mesa County for damages caused to certain segments of these roadways due to extraordinary/unusual peak use.
85	195	6 6.6.28	The Department of Highways has planned a bridge replacement project for the west-bound Fifth Street Bridge during 1988-1989. The total duration of this construction project is estimated to be approximately 6 to 8 months (possibly to one year). The DEIS needs to address this major temporary traffic congestion problem.
86	206	1 6.21.8	The DEIS indicates that out over 6,900 known contaminated vicinity sites, less than 4,000 will be cleaned up by UMTRAP. Large volumes of contaminated deposits will be left in uncontrolled areas within communities of Mesa County. These deposits will include, among others, those tailings deposits which are undiscovered, and those which, due to their defined volume, do not appear to exceed the EPA standards. Existing instrumentation and measurement techniques are not sensitive enough to allow detection or complete identification of presently shielded or partially shielded deposits. Experience gained in Mesa County during the past 14 years indicates that many of these deposits will be disturbed, moved, spread or built over in the normal progression of renewal within the community. These tailings deposits must be controlled to ensure that the radiation exposure to the public - primarily alpha radiation exposure through elevated radon levels in structures built over or adjacent to these deposits - is not increased. This effort will continue to impact State and local governments long into the future. What is planned to mitigate these consequences?
87	207	1 6.21.9	The continual spreading of contamination in uncontrolled ways through human misuse should also be discussed.

Comment #	Page	Paragraph	Comment
88	A-7	2 6.21.10	The description appears to misrepresent the EPA indoor RDC standard. 40 CFR 192.12 states that "the objective of remedial action shall be, and reasonable effort shall be made to achieve...an indoor RDC not to exceed 0.02 WL". If after remedial action has performed the indoor RDC level is between 0.02 and 0.03 WL, the implementing agencies would then consider what further action should be taken to comply with the Standard. Please see our letter to you dated March 26, 1986. (attached)
89	B-7	1 6.4.26	Construction of the permanent drainage ditch around the stabilized pile has been deleted. Should not this ditch be armored with riprap to protect against erosion effects?
90	B-10	2 6.9.17	5th sentence - A minimum vertical separation distance between the calculated expected highest ground water level and the base of the stabilized pile should be defined through consultation with the NRC and the State. Ground water mounding could occur beneath the Stabilized-On-Site pile. Changes in the river morphology could also lead to increased levels of recharge to the site from the Colorado River within the 1000-year design life.
91	B-10	3 6.4.27	The mixing described in sentences 2 and 3 should be designed into the RAP/final design and not presumed a priori to be unnecessary.
92	B-10	4 6.24.3	See comment #24.
93	B-10	5 6.4.28	If feasible, every reasonable effort should be made during remedial action to segregate uncontaminated organic materials such as wood demolition debris, and that fraction of concrete slab fragments, chunks, etc..., that is uncontaminated, and dispose of these materials at some location other than within the repository embankment. The volumes of such materials will be significant, and if not reduced could pose major problems in the tailings compaction effort, and possibly lead to increased levels of differential pile settlement.
94	B-16	5 6.4.29	Additional drying of lower lying, more saturated tailings and contaminated soils may be required. Areas may need to be set aside for windrowing of these materials.

26

Comment #	Page	Paragraph	Comment
95	B-19	3 6.4.23	See comment #22.
96	B-19	6 6.4.30	2nd sentence - Recommend rephrasing as "uncontaminated materials excavated from each pond would be stockpiled..."
97	B-20	2 6.4.31	3rd sentence - Does not make sense.
98	B-30	4 6.4.24	The accumulation of intergrain clay or soil wash and windblown silt and sand in the rock riprap and filter layer can eventually be expected. Plant growth, including some deep-rooting species, will become established on the pile through natural succession. Increasing root development will have the potential for prematurely disrupting the integrity of the radon barrier.
			The effectiveness of the proposed rock riprap pile cover in preventing intrusion by burrowing animals (e.g. ants, prairie dogs) has not been thoroughly demonstrated.
		6.5.13	The long range costs associated with maintenance of the disposal site to mitigate the impacts of plant and animal intrusion (desiccation and freeze-thaw) could be substantial under the proposed design, and could represent a significant portion of the total reclamation cost.
99	B-35	6.4.32	"'Cheney Reservoir Site', 1st bullet...(approximately five miles)"
100	B-39	2 6.4.24	See comment #98.
		6.4.24	During period of extended dry weather the rock cover may not be effective in providing complete protection against drying and cracking of the upper reaches of the radon barrier.
101	B-4	Fig. B.3.6 6.24.14	See comment #55.
102	B-53	5	The Colorado Department of Highways has provided more detailed information (see attached letter dated May 20, 1986) regarding some specific improvements and possible mitigative efforts for such critical road junctures as the intersection of U.S. Highway 50 and the Cheney Reservoir

Comment #	Page	Paragraph	Comment
102	B-53 Continued	5 6.6.29	access road, and the intersection of S.H. 141 and Highway U.S. 50. 4th sentence - Recommend rephrasing as "Areas of concern include the entire route within the Grand Junction city limits, D Road from 15th Street to S.H. 141, the two-lane reaches..."
103	B-56	5 6.4.33	2nd sentence - Should be rephrased as: "This would restrict water buildup over the earth cover and reduce the potential for frost heave (ice lens formation...)..."
104	B-56	7 6.4.24	See comment #98.
105	B-57 B-58	Section B.3.8 6.4.34	Design features and in-situ soils would tend to reduce the potential for contaminant migration from the tailings. Use of the words "minimize" and "minimal" throughout this section should be reconsidered and any appropriate revisions made.
		6.4.35	Last paragraph, 1st sentence - Recommend rephrasing as: "site the tailings would be placed above this water table."
106	B-79	1 6.4.33	See comment #103.
107	E 1-19	3 6.19.2	The sinkhole(s) at the Processing Site should receive special attention during remedial action. It could be indicative of subtailings alluvial channelization which could be creating enhanced alluvial dispersal of contaminated tailings and other areas of hidden instability.
108	F-170	1 6.4.36	A system for controlling induced flow (recharge) from the Colorado River and ground water has already been described to allow for effective excavation of saturated, lower-lying contaminated zones at the tailings site. Therefore the statements made in this paragraph concerning installation of a slurry-wall and the associated increases in cost appear to have been made out of context with other sections of the DEIS.
109	F-172	5 6.9.18	The cost-effectiveness of a scaled-down restoration effort (e.g. concentrated in the area of the former mill/tailings pile site) utilizing the proposed waste-water treatment unit (e.g. approximately 300 gpm [?]) should be further investigated, and the implications discussed with the State of Colorado. Please also see comments of the Colorado Geological Survey.

26

Comment #	Page	Paragraph	Comment
110	I-21 and later	5 6.11.17	Unless a subcontractor can be forced to place special shielding on mobile equipment, a 1-inch iron equivalent shielding will probably not be provided by the vehicle. The gamma radiation estimates should be re-examined on the basis of real equipment.
111	I-32	5 6.11.18	2nd sentence - "dose equivalent to the lung of 31 mrem/yr."
112	I-50	5 6.11.19	1st sentence - "The radon concentration may be estimated to be..."
		6.11.20	The value estimated for the dose equivalent commitment from radon daughter exposures for the "maximally exposed resident" - 9.1 mrem/yr - appears to be too low on estimate. For a resident living full-time at this location, shouldn't the weighted radon daughter conversion factor of 4.38 X 10^{-4} rem/hr (pCi/1) have been used for indoor conditions)? The radon concentration value of 4.68 pCi/1 appears to be too low an estimate, e.g. when compared to data presented in Section I.3.2.1 (par. 2). Documented indoor RDC data (on file at the Grand Junction Office of the CDH) for structures nearest the pile should also be investigated. Reasonably conservative estimates suggest that the 9.1 rem/yr value quoted could be a factor of approximately 2 or 3 too low.
113	Appendix I and Volume I	6.11.21	General comment - It is difficult to pull together the excess cancer/death risks from the report.
114	I-50	6 6.11.22	It is assumed that no such scenario would be allowed - i.e. would not be permitted by the authorities to take place!
115	I-65	6 6.11.16	See comment #60.
116	J-5/J-6		See attached comments of the Colorado Historical Society.
117	K-75	5 6.21.3	See comment #2.
118	K-77	1	See earlier comments on land use and land values.

Comment #	Page	Paragraph	Comment
119	K-79	2 6.17.4	See comment #75.
120	K-79	4	See comment #118.
121	K-80	2 6.9.19	Contaminated ground water at the Grand Junction site could have potential impacts for agricultural water resources.
122	K-81	4	See earlier comments on land use impacts.
123	L-1	5 6.21.4	See comment #3.
124	L-2	1 6.21.3	See comment #2.
125	L-2	5 6.21.11	1st and 2nd sentence - Should be revised to: "Approximately 640 vicinity properties have been identified as qualifying for remedial action under GJRAP and remedial action has been performed at approximately 570 properties. Of the 640 properties..."
126	L-3	Table L.1.1 6.21.12	Item 6 - "GJRAP will involve clean-up of about 600 buildings." UMTRAP - See comment #2.
127	L-5	2 6.21.13	Schools are listed in the commercial vicinity properties category. Should they not be considered separately?
128	L-5	3 6.21.14	Recommend revising "complex" to "complex or unusually significant".
129	L-7	3 6.21.15	3rd sentence - "In addition, between 1969 and the present, on-site surveys..."
130	L-8	Fig. L.3.1 6.21.16	The chart is misleading in that it leads one to believe that the whole process for a location will be completed in 14 months, when in most cases it is longer.
131	L-9	4 6.21.17	Lase sentence - Recommend rephrasing as: "The Radiological and Engineering Assessment (REA) defines the areal extent and depth of all radioactive mill residues on the site.
132	L-10	2 6.21.18	3rd sentence - Recommend rephrasing as: "..., the drill hole depth may not be sufficiently deep to penetrate the contamination, and may or may not allow one to accurately define the depth to clean material."
133	L-11	2 6.21.19	The State also signs the RAA and pays for 10% of the cost of construction.
134	L-13	1 6.21.20	Appendix C is not used anymore.

26

STATE OF COLORADO

RICHARD D. LAMM
GOVERNOR

JOHN W. ROLD
DIRECTOR

COLORADO GEOLOGICAL SURVEY
DEPARTMENT OF NATURAL RESOURCES
715 STATE CENTENNIAL BUILDING — 1313 SHERMAN STREET
DENVER, COLORADO 80203 PHONE (303) 866-2611

June 6, 1986

Mr. Paul Ferraro
Program Manager, UMTRAP Project
Colorado Department of Health
4210 East 11th Avenue
Denver, CO 80220

Dear Paul:

RE: DRAFT EIS, GRAND JUNCTION UMTRAP SITE

We have reviewed the DEIS for the Grand Junction UMTRAP site. This letter provides a summary of the issues we consider to be most critical. Specific comments are provided on a page by page basis as an attachment to this letter.

6.4.37 The feasibility study of design alternative number two, Stabilization-on-Site (S-O-S), does not fully address the potentially disruptive impacts of the Colorado River. The working life of engineered solutions to radon gas control and water resources protection can be affected by changes or events within the river system. These changes, including meander encroachment, possible channel avulsions, and the potential effect of repetitive flood events, need to be further evaluated in the DEIS.

6.9.12 Predictions provided in the DEIS of possible maximum uranium concentrations in groundwater at the Processing Site suggest that uranium and other contaminants may persist in the local groundwater for several hundreds of years with the S-O-S option. More detailed analyses and modeling of river cutting forces and future groundwater contaminant movement are needed to demonstrate the adequacy of this proposed containment option.

6.4.23 Water quality will very likely be affected by excavation of the tailings from the Grand Junction site, especially where these tails and contaminated soils are below the water table. A reasonable method of flow control may be the installation of a slurry wall along the east side, and along the river side of the property with an appropriate down-gradient well withdrawal system and water treatment facility.

There appear to be several problems associated with groundwater at the Grand Junction site. Principal among these is the determination of "background" levels in groundwater at the Processing Site. Well completion techniques and the locations of certain monitoring wells may not fully describe representative background conditions. In addition, there is evidence to suggest that some of the groundwater sampling and analytical program is in error. Interpretations based on this data must be made with extreme caution.

GEOLOGY
STORY OF THE PAST . . . KEY TO THE FUTURE

Mr. Paul Ferraro
June 6, 1986
Page 2

6.9.12 With respect to the existing data base, we believe that the contaminant plume leaching from the existing pile may contain additional contaminants from the tailing pile. The natural flushing and cleanup that will occur at the processing site after removal of the tailings has been quantified through the use of a small model. However, the time required to naturally flush contaminants from the alluvial system may be measured in centuries, instead of the 100 years or less as presented in the DEIS. A more sophisticated model may need to be developed for inclusion in the DEIS.

6.9.20 Estimates of infiltration rates at the Cheney Reservoir Site and the Processing Site show a wide range of values. The assumptions used to calculate infiltration rates appear to govern these rates. The CGS would like to work closely with the DOE to better define estimates of infiltration, to develop realistic projections of future contaminant flux rates, and discuss potential cover and designs to mitigate any adverse conditions and/or impacts to groundwater.

Sincerely,

Walter R. Junge
Engineering Geologist

Attachments

bcr:WRJ-86-018
3127/15

Comment #	Page	Comment
1	26 6.4.37	Long-term geomorphic processes, including erosional undercutting (and subsequent bank failure) due to meander encroachment by the Colorado River, possible channel avulsions, and the effects of cumulative flood events have the potential to disrupt the stabilized-on-site (S-O-S) pile in much less than 1000 years. Calculations provided of PMF water levels, scour depths and maximum flood velocities along the proposed S-O-S pile edge have only been performed for the river based on its present configuration. Modeling should be done for several alternative channel boundary geometries and associated hazards to fully assess the stability of the site. Designs would have to mitigate the impacts of any such potential future changes in the Colorado River. Examples of additional design features which may be appropriate are keying of the rock armor wall into competent bedrock (i.e. to a depth below the soft, weathered zone of the Mancos), and extending the compacted radon cover and cap layers into the natural ground behind the armor wall). This would probably increase the cost of this alternative significantly.
2	30 6.5.14	Cross-sections of the Cheney Reservoir site (eg. F-181, F-182) indicate that rather extensive zones of gravely/cobbly and sand material exist within the excavation zone. The surficial layer of alluvial, colluvial, and eolian deposits ranges from about 23 to 42 feet in depth, and is apparently comprised mostly of debris fan/flow deposits. The costs associated with sorting/reworking of these on-site soils to obtain cover materials needs to be compared with the costs of developing and utilizing an alternate borrow site, and cost-vs-performance studies should be presented to evaluate the cost-effectiveness of various proposed cover designs.
3	160 6.9.21	First and third bullets: In order to minimize further contamination of the local groundwater system during the extensive excavation activities, the DOE should consider performing interim aquifer restoration (eg., pumping and treatment) of contaminated ground waters in the shallow alluvial aquifer beneath the processing site. Use of the proposed water treatment unit could be optimized, and partial removal of some or most of the higher concentrations of plume contaminants in the sub-pile ground water would also be accomplished. The economic and technical feasibility of such an effort would also be enhanced by the use of whatever system of ground water/surface water intrusion control is selected (eg. sheet-pile system or clay-filled (slurry trench). Cost/performance effectiveness estimates should be evaluated for this clean-up effort.

26

Comment #	Page	Comment
4	B-38 6.4.28	Demolition rubble containing large slabs of concrete or portions of brick walls will be difficult to compact around. Provisions should be made for assuring that small enough chunks can be obtained for better compaction. Efforts should be made to sort uncontaminated demolition rubble from contaminated rubble for disposal elsewhere.
5	B-38 6.4.38	No mention is made here of the treatment and compaction of the sides of the excavation.
6	B-38 6.4.39	Mixing of the tailings sands and slimes on site, to assure a uniform moisture content, may be difficult where excavating from below the water level. Since this will be late in the project, dry blending material may be in short supply and hauling of saturated tailings for blending at Cheney Reservoir will increase haulage costs.
7	B-38 6.4.40	Grubbed brush will prove difficult to uniformly place at 5% volume which could lead to excessive settlement. The brush should be disposed of by means other than site burial.
8	B-39 6.22.2	Monitoring wells should be installed down gradient from the Cheney site which could be sampled for contaminates following tailings burial.
9	B-41 & B-14 6.4.18	The decontamination facility, including the waste-water retention basin, should be described in greater detail.
10	B-41 6.4.41	The below grade hopper should be designed such that no interference with groundwater will result.
11	B-45 6.5.8	The proposed 18 cubic yard capacity trucks will have a deleterious impact on pavement and subbase. Cost of additional road maintenance should be considered in the relocation proposal.
12	B-49 6.2.9	Extending the program for four years or more will not necessarily decrease the intensity. Intensity will be on a high level on the front end of the project for a given period. The contribution from vicinity properties will extend the project for many months after the intensive hauling has been completed.
13	B-110 6.4.42	Basal layer standard proctor compaction to 95% is inconsistent with B-57, paragraph 5.
14	B-114 6.4.43	Utilizing a computer program which assumes a circular failure surface does not address movement associated with a composite failure surface or with an infinite slope, planar failure. Both of these failures could occur with the failure plane represented by the low permeability clay barrier and the high phi angle tailings sand. A steep angle of failure as opposed to the flat angle shown in Figures B.6.8 and B.6.9 is more likely as the failure surface crosses the armoring.

15 F-62, 6.9.22 — The use of Bureau of Reclamation wells 711 and 712 appear to be good choices for defining alluvium water background. However, wells 588 and 744, as shown on page F-83, may not represent "true" background conditions. Well 588 is directly down-gradient from the site, and well 744 is approximately 750 feet lateral to the site. The presence of vanadium in the February '83 chemistry of well 588 appears to confirm that the future use of these wells for defining background may lead to difficulties in interpreting the collected data.

16 F-136, 6.9.23 — Well 743 may not adequately define the background water quality for the Mancos groundwater. This is due to the likely presence of cement contamination observed in the reported analytical results for this well. In addition, this well, according to the water table contour map on page F-57, is not hydraulically up-gradient from the site, but rather is lateral to it.

17 F-137, 6.9.24 — The method for selecting a background well to represent groundwater from the Dakota Sandstone appears to be well founded, but well 725, along with several other wells in the monitoring program, may have been completed improperly. Except for a few extremely rare geological settings, pore water from sandstone does not have a pH of 12.6, as is reported for this well on page F-109 of the DEIS. According to Langmuir, 1986, (personal communication), extremely elevated values of pH in a monitoring well are almost always an obvious sign of cement contamination within the well. (Don Langmuir, Professor, Department of Geochemistry, Colorado School of Mines, Golden, Colorado.) Wells 729, 731, 735, 741, 743, also exhibit this diagnostic sign of improper completion. Thus, the statement made on page 84 of the DEIS with regard to Mancos water having a pH value outside the range established for EPA drinking water standards should be modified. Since wells suffering from this problem were used to define backgrounds conditions for the Processing Site, we believe that "background" has not been adequately characterized to date.

18 F-138, 6.9.25 — It is most likely that the high value of ammonium and uranium reported in well 710 can be interpreted as evidence of contamination from the Grand Junction site. We do not agree with the statement that these facts provide uncertain evidence for contamination. We feel that the presence of these ions can be used as evidence for contamination.

19 F-139, 6.9.26 — From an examination of the measured concentrations of molybdenum in the monitoring wells located down-gradient to the site, there appears to be evidence of a moly plume leaching from the site. The DEIS concludes that this is not the case, but inspection of the data leads to the conclusion that a moly plume does exist. The elevated concentrations of molybdenum at the processing site, and in seven wells located down-gradient to the site, indicate that a moly plume does exist.

26

20 F-140, 6.9.27 — Considering the substantial amounts of selenium that are found in the processing site wells and the potential high mobility of this element, it appears reasonable to assume that the tailings might be leaching out a plume of selenium to the down-gradient alluvial system. Presence of elevated levels of selenium in three down-gradient wells appears to be evidence for the existence of such a selenium plume. The levels in wells 725 and 729 may be a reflection of the apparent naturally elevated background conditions, but well 735 provides cause for further monitoring.

21 F-140, 6.9.28 — There appear to be many inconsistencies in the relationship between conductance and total solids, for the majority of analyses reported in Table F.3.7 of the DEIS. The conductance multiplied by a factor less than one, (often about 0.59), will yield an approximate value for TDS. According to Hem, 1985, p. 164, "the dissolved-solids value in milligrams per liter should generally be from 0.55 to 0.75 times the specific conductance in micromhos per centimeter for waters of ordinary composition ..." (USGS WSP 2254). Table F.3.7 shows many samples with a TDS greater than the conductance, not less. In addition, the TDS values as computed by summation are not in complete agreement with the values reported in Table F.3.7.

6.9.29 — Because of the apparent problems with the analytical quality stated above, a preliminary examination of the charge balance (the cation-anion balance) of several samples was performed. "Lack of charge balance is a meaningful clue to the errors in analyses and a large error probably makes a solution unsuitable for reaction simulation." (Parkhurst et al., USGS Wat.Res.Inves.-80-96, p.21). Four analytical results were computed for balance, and two were found to have serious problems. In view of this, we recommend that cationic-anionic balances be reported for laboratory analyses be included in the DEIS, as an assessment of the quality of the analytical results. Analytical results used in the groundwater evaluation should be within a cation/anion balance of less than 5%.

22 F-141, 6.9.30 — The text of this section reports the March value of uranium in well 739 to be 60 pCi/l. Yet on page F-122, the table of chemical analyses reports a March value of 8324 pCi/l for U-234 in this well. This contradiction should be corrected.

6.9.31 — The available data on background levels for uranium indicate that the maximum background value for uranium at this location should lie between the range of 23 and 33 pCi/l. The two wells to the north and northwest, with reported values of 58 and 60 pCi/l, are clearly above this range of maximum background levels. These wells do reflect contamination and should be described in the DEIS. In a similar fashion, it appears clear that well 710, with a value of 52 pCi/l, also reflects contamination from the tailings.

23 F-142 6.9.32 — The area of elevated zinc contamination should be delineated on a base map of the site.

24 F-149 6.9.33 — Footnote "a" of Table F.3.9 states that the data in this column came from Table F.3.4. Is not Table F.3.5 (p.F-61) the source of this information? Also, is Table F.3.6 the source for footnote "c", instead of Table F.3.5?

25 F-150 6.9.14 — The predictions of the mixing cell model indicate that residual uranium concentrations will be flushed within 100 years. The mixing cell model is marginally useful in providing a first approximation of the time required for natural cleanup. However, the assumptions upon which the model are based - a completely mixed system and no geochemical retardation - severly limit its usefulness. Use of a more detailed model should be considered to determine more realistic cleanup rates at the Grand Junction site, for this alternative.

26 F-150 6.9.34 — Third paragraph. Substantiation is lacking for the statement that a sporadic distribution of other contaminants is clear evidence that one or more of the listed attenuative processes is in operation. Sporadic distribution of contaminants could also be a consequence of the design of the monitoring well network, or the natural variability that occurs in contaminant dispersion patterns.

27 F-150 6.9.35 — Fourth paragraph. For the reasons outlined above, we agree with the statement that uranium and ammonia have a definable plume. However, we believe that clearly definable plumes of other constituents are present at the Grand Junction site. The DEIS conclusion that other contaminants will be rapidly flushed should be based on model analyses. The use or lack of use of groundwater can not, and should not, be considered when predicting natural cleanup rates of a contaminated water bearing unit. The assumption that the use of the groundwater and its cleanup rate are related is invalid.

28 F-150 6.9.36 — While there are no data on uranium concentrations within the pore water, page 53 of the 1983a DOE study by Markos and Bush shows a well adjacent to the tailings with a uranium concentration of 14 ppm (mg/1), or 9,333 pCi/1 (well 10). Page 54 of the same report shows a sample taken with a uranium level of 3.4 ppm, which is approximately 2266 pCi/1. Considering these known levels, a concentration of greater than 600 pCi/1 should be used as the highest levels of observable uranium.

29 F-157 6.9.37 — "Method 2" assumptions do not appear to be conservative.

6.9.37a — With regard to the first assumption, significant characteristics of the proposed cover design may modify this statement. There is evidence to suggest that rock covers lacking vegetation will increase infiltration. It has been shown that, "rock covers generally increase infiltration and decrease evaporation", (Mayer et. al., 1981, PNL-4132, UMT-0207), (Kirkham et. al., CSU Symposium, 1982).

6.9.37b — Assumption number two is not supported. Please provide the documentation for this assumption.

6.9.37c — When the tailings are unsaturated, the gradient will always be essentially vertical. Further, the conditions described in this assumption would be ideal for setting up lateral <u>and</u> vertical gradients.

6.9.37d — The last assumption on this page appears to be invalid. If snows are light and do not remain on the ground long, then they are melting rapidly. Although evaporation of the snowpack by wind action will certainly account for part of the snowpack removal, it will not be the only control acting to remove the snow. The latent heat of fusion for one gram of ice (the heat required to melt one gram of ice into water) is 80 calories, while the latent heat of vaporization (the heat required to evaporate one gram of water) is 590 calories. The void spaces or "pockets" in the rock cover will shield the snow and resultant melt water from the evaporative actions of wind and sun. Because of these facts, most of the snow will begin to infiltrate as it melts, long before it begins to evaporate. Thus, infiltration of melting snow will most definately occur, and will probably represent a significant portion of the total amount of water that infiltrates into the impoundment.

30 F-159 6.9.37e — The final two assumptions on this page are also unsubstantiated. If precipitation events equal to or greater than 0.1 inches take place over an average time of 5.5 hours, then the infiltration capacity of the soil is less likely to be exceeded, and Horton Overland Flow (sheet flow) may not occur at all. The net effect of this will be to increase infiltration, not decrease it.

Since the predicted infiltration rate through the cover is based on these assumptions, the values in Table F.3.12 appear to be erroneous.

31 F-188 6.9.38 — The section on the saturated zone hydraulics indicates that water levels were obtained in March and May of 1985. This does not appear to be a broad enough timespan to adequately characterize the groundwater regime at the Cheney Reservoir site. On page F-192, Figure F.4.7. shows that there is an irrigation ditch that runs nearly perpendicular to the site, at a location approximately 1/2 mile up-gradient. The normal period of flow through this ditch is during the summer months. Because this ditch is unlined, a significant amount of water will probably be leaking from the bottom during periods of flow. This might cause a rise in the water table beneath the Cheney site beginning at sometime later to the irrigation season. The existing data base of water level measurements may not reflect its occurrence. Since the ditch is about 1/2 mile away, this component may not produce significant head differences. However, to rule out this possibility, it is recommended that additional water level measurements be obtained at the Cheney site, at the end of the irrigation season.

32	F-191	6.9.39	The average linear velocity of the groundwater could be understated. The values of hydraulic conductivity used for the calculations reporesented in the DEIS could be too low. When the highest measured in-situ permeability of 2 X 10-4 cm/sec is used to determine average linear velocity, the range becomes 22-172 feet per year.
33	F-193	6.9.40	The infiltration calculations of this section of the DEIS do not appear to represent a worst case scenario. The maximum flux rate from page F-190 would be about 5.2 ft per year, based on the highest measured in-situ permeability of 2 X 10-4 cm/sec, as shown on Table F.4.4. This in turn yields a Q of 1.37 X 10^5 ft^3/year. When the area is measured from the top of the Cheney Reservoir Site up to Whiting's Ditch, as illustrated on Figure F.4.7, (p. F-192), the value for this parameter becomes 5.8 X 10^6 ft^2 (2200 ft X 2640 ft). The quotient of this new flux rate divided by the adjusted area then becomes 2.3 X 10^2 ft/yr, or an infiltration rate of 0.28 inches per year. This represents a difference of two orders of magnitude from the values stated on this page of the DEIS.
34	F-194	6.9.38	The amount of recharge to the site from Whiting's Ditch needs to be quantified. The ditch flow should be measured immediately above and below the site boundaries, for determining leakage. If this leakage is found to represent a significant source of groundwater recharge to the Cheney site, then additional mitigative features should be investigated for the purposes of reducing this influx to groundwater.
35	F-195	6.9.41	It may not be valid to conclude that discharge occurs far from the site or is neglible due to evapotransporation. Because there is a potential for contaminant migration after permanent closure of any impoundment, the local hydrological regime should be further defined to the extent of knowing where and how discharge occurs. This information might prove useful in the design of the post-closure monitoring plan.
36	F-196	6.9.42	It seems probable that the high Total Organic Carbon is a residual effect of the drilling fluid. The gradient of 0.025 does not support a stagnant water table scenario.
37	F-197	6.9.43	The second and forth analyses listed on Table F.4.6 appear to have typographical errors in the reported values for pH.
38	F-203	6.9.44	This particular method for determining infiltration rates appears to be oversimplified. This application of the equation for wetting front advance has modeled precipitation by using 41 equally sized low magnitude precipitation events occurring over a one year period. The natural variability that occurs between different rainfall events is not represented in these calculations. Larger precipitation events will influence infiltration, and have not been considered in the model.

26

39	105	6.17.1	Sec. 4.9.3. Land use at the Cheney Reservoir site should be addressed with respect to the proposed Dominques Reservoir. Testimony by representatives of the Mesa County Dominques Reservoir Advisory Council at the Grand Junction, May 6, 1986, public hearing, indicated serious concern due to the proximity of the Cheney Reservoir site to the proposed Dominques Reservoir site.

3127/5

Inter-Office Communication

To: Paul Ferraro Date: May 30, 1986
From: Richard D. Fox Subject: UMTRAP, Grand Junction DEIS

Thank you for providing the Air Pollution Control Division (APCD) the opportunity to review and comment on the Draft Environmental Impact Statement for the Remedial Actions at the Former Climax Uranium Company Uranium Mill Site in Grand Junction. Our office performed a cursory review of the documents and conferred with our staff in the CDH Grand Junction office in order to provide you with the following comments.

6.20.4 Our primary concerns result from Table 5.6 on page 150 of Volume One. A violation of the primary Total Suspended Particulate Matter Standard is indicated from the air quality modeling performed by DOE and presented in Table 5.6. DOE will be required to obtain Emission Permits for both the Mill Site in Grand Junction and the disposal site. Unless sufficient emission control measures are applied to both site activities to prevent a (modeled) violation of the Total Suspended Particulate Matter Standards, APCD shall have no choice but to deny the Emission Permits.

6.20.5 Haul truck traffic on unpaved roads is also expected to violate the primary Total Suspended Particulate Matter Standard, as indicated in Table 5.6. Pursuant to the Colorado Air Quality Control Commission's Regulation No. 1, Section III.D., if complaints are registered with APCD that emissions from the unpaved roads are creating a nuisance, and if traffic count minimums are exceeded, APCD shall require the owner or operator of the roads to submit a control plan to abate the emissions from the roads. These provisions apply to County roads, as well as private roads, and the Mesa County Planning Department shall be provided with a copy of our comments to inform them of our requirements.

6.20.6 Due to the location of the Mill Site in Grand Junction, the fugitive particulate emissions control plan, which DOE will be required to submit with the Emission Permit application, should reflect controls which provide the Lowest Achievable Emission Rate (LAER) due to the potential to emit radionuclides. Radionuclides are considered to be hazardous air pollutants by EPA. APCD shall carefully review the control plan for adequacy as Grand Junction is a Non-Attainment Area for Total Suspended Particulate Matter. The Non-Attainment Area status means that area has not achieved the National Ambient Air Quality Standard for a particular pollutant. Please be advised that EPA is in the process of developing a PM10 Standard, and depending on the start-up date of the project, this new standard for particulate matter may affect modeling analyses as well as the Non-Attainment Area status. Note: A control plan will be required for the disposal site as well, which will also be carefully reviewed.

Comments received from our Grand Junction office indicated a preference for locating the disposal site at the Two Road alternative and transporting the material by rail. Should haul trucks be used, every effort should be made to prevent the off-site transport of tailings onto paved and unpaved roads.

This concludes our comments on the DEIS for the UMTRAP in Grand Junction. We would appreciate the opportunity to review the Final EIS for this project. Please contact me should you have any questions.

COLORADO DEPARTMENT OF HEALTH
Radiation Control Division

INTER-OFFICE COMMUNICATION

TO: Paul Ferraro DATE: June 2, 1986

FROM: David Gourdin SUBJECT: Comments Concerning the Draft EIS for UMTRAP Remedial Action at the inactive Grand Junction Uranium mill site (DOE/EIS-ORG-D)

The following are comments generated from my review of the above DEIS Volume I text, and Volume II Appendices dated March, 1986.

6.13.2 Presentation of the noise impact data read well to the uninformed.

6.13.1 The document does not address transportation noise impacts. It is difficult to imagine that an estimated 26 to 74 trucks passing by per hour wouldn't be adverse to noise sensitive receptors.

There were no noise mitigation measures presented to attenuate the adverse impacts upon the receptor populace.

6.13.3 The environmental noise survey data including presentation of summary of results did not address the distribution of wind direction and speed, terrain, vegetative cover, deflective surfaces, valley, induced upslope and downslope air flows. Each of these elements could increase or decrease the noise impacted areas.

Attached are specific comments relating to my concerns including a list of mitigation measures that should be incorporated into the EIS.

Even though the noise impact section was written well, the real and dominant noise impact of transportation needs to be evaluated and presented for our review.

6.13.4 The preferred alternative from the standpoint of the least noise impact to the community is the Two Road Alternative, transporting the material by rail.

Signature

DG/kp

5.8.5 Transporation Routes:

Truck noise impacts are not adequately addressed. Table 5.10 is not clearly presented and alludes to a vague interpretation of the truck passby noise. Truck noise is the dominant source.

6.13.1 Truck noise is substantial. The noise produced by the daily round trip truck activity is not addressed. Impacts to residents and noise sensitive landuses adjacent to the transportation corridors need to be identified. Mitigative measures must be included to attenutate this dominant noise source and enforcement of a muffler noise emission ordinance should be in effect.

6.13.7 Table 5.11 "Impacts on average daily traffic volumes by remedial action alternative" clearly identifies the one-way truck trips per day. The true impact is the realization of round trips meaning twice the number of truck trips per day.

6.13.1 Therefore, the truck transportation noise impact section needs to be expanded to present the actual noise impacts from this major activity.

5.20 Mitigative Measures:

No mitigative measures were identified for the abatement of excessive noise.

The following mitigative measures would assist in attenuating excessive noise to the impacted community.

Conform to Colorado Noise Abatement Statutes time periods for maximum permissible noise levels for sensitive noise receptor land uses;

Construct properly designed noise fence, barrier, or berm adjacent to noise sensitive receptors. This includes proper placement from source to receiver, height of barrier, and proper material selection;

The community should adopt a comprehensive noise ordinance to include an enforcement mechanism for adequate protection to the public;

6.13.8 All construction equipment that requires a muffler should have proper functioning quiet design mufflers;

Require preventative truck/equipment maintenance program to be implemented;

Require quiet design functional mufflers on all equipment especially haul trucks;

Require tailgates and any other metal-metal source be firmly secured during transportation;

Restrict dynamic breaking devices (jake brakes) within the city limits and near any noise sensitive receptors except for the aversion of imminent danger;

Require ongoing road maintenance program to reduce secondary noise impacts from nonuniform road conditions, chuckholes, washboard effect;

Provide direct funding for road maintenance beyond pay road use taxes.

26

5.8 Impacts on Noise Levels:

The noise prediction model (Kessler et. al., 1978) was used to estimate the maximum A-weighted equivalent sound level emitted from the tailings, disposal and borrow sites. The document states that this noise model is conservative due to a lack of data input for attenuation of air absorption, berms, or foliage and the predicted results are probably higher than would be realized. I disagree.

6.13.5 The model does cluster all equipment into a group and treats it as a single event source. It predicts an average of all components. The model assumes all activity is conducted at the center of the site and not at the perimeter boundary. Also, it is assumed that all earth moving and excavation machinery is in good mechanical working condition and that the mufflers are functioning properly as designed. This is hopeful but doubtful. The model predicts equivalent sound levels which are averages where single event sounds are much higher.

This noise prediction model is a good tool for general predictions/assumptions, but as with most models it has its limitations.

The document clearly states that during all of the proposed alternatives (except the no action alternative), daytime noise levels for residents living near the pile would be elevated by more than 10 decibels above existing ambient levels. Residences near the Cherney Reservoir and Two Road sites would realize an increase of about 15-20 decibels while near the borrow resident sites, the ambient level will be elevated by 20 decibels.

6.13.6 Doubling of sound levels occurs with an increase of each 3 decibel elevation. Sounds are perceived by people to be twice as loud when the level is increased by at least 10 decibels. These levels produce community reactions such as annoyance, activity interference, social and speech interference, disruption of the educational process if near a school, and possibly sleep interference. For instance, speech interference occurs approximately at 65 decibels while sleep interference can occur at any sound level. The important point here is that noise is subjective. It is difficult to make a statement that the noise is short term and minor annoyances will result to neighbors. Noise is a stressor. Reaction is more complex since the quality of life factors are typically ignored during noise assessments including the age distribution of the population affected by these projects. Tolerance levels are substantially different from the young to the elderly. Mitigative measures must be included to attenuate the noise emissions from the construction-excavation process and transportation corridors. These simple measures include sound barriers, fences, and/or berms, time of day of operation, proper function mufflers, etc.

STATE OF COLORADO

DEPARTMENT OF HIGHWAYS
4201 East Arkansas Ave
Denver, Colorado 80222
(303) 757-9011

MAY 1986
OFFICE OF HEALTH PROTECTION

May 20, 1986

Mr. Paul Ferraro
Office of Health Protection
Colorado Department of Health
4210 East 11th Avenue
Denver, Colorado 80220

Dear Mr. Ferraro

The Colorado Department of Highways has reviewed the Draft Environmental Impact Statement for Remedial Action on the Climax Uranium Mill Tailings Site in Grand Junction. We are concerned about the frequency of the truck haul and the selection of the haul route to the disposal area for the following reasons.

6.24.16 The DEIS states that SH 146 (32 Road) is being improved. The improvements to SH 146 (now designated SH 141) are complete and are located north of the designated haul road (D Road). We have no improvements planned for the segment of SH 141 between D Road south to US 50.

6.6.28 The return trip of the haul road occurs on US 50, back into Grand Junction on Fifth Street. We have programmed a bridge replacement project for the west-bound Fifth Street Bridge over the Colorado River during Fiscal Year 88-89, which could affect the movement of a large number of trucks associated with the tailings removal process. We offer this information as construction will require a two-lane, two-way detour utilizing the eastbound bridge which will result in temporary traffic congestion.

6.6.30 The intersection of US 50 and the Cheney Reservoir Disposal Site road will require the Department of Energy to submit an access permit for this haul road access point. As a safety consideration, we will request that this intersection be fully channelized to include a left-turn lane and an acceleration lane to meet current design standards. A blank access permit has been included with this letter for your use when the project nears the implementation/construction stages.

Because of potential traffic conflicts with the intersection of SH 141 and US 50, signals may have to be installed or flagmen used at this intersection during hours of extensive truck haul.

6.5.8 We also request that the costs associated with the repair of highway surfaces or stabilization resulting from this repetitive truck haul activity be paid

6.5.8 for by the Department of Energy. These would be damages other than normal or routine maintenance activities. Repetitive, heavy truck hauls on roadways result in severe damage to the asphalt surface and subgrade stabilization. Usually, the slower the truck movement, the more extreme the damage.. Therefore, we expect a problem on SH 141 heading south after crossing the bridge over the Colorado River.

As noted in the above comments, we have no serious concerns about the project but do have some responsibilities for the safety of the traveling public and the existing public highways during the tailings removal and haul to the disposal area. If our request for the considerations noted above are incorporated into the overall tailings removal project, our concerns will have been satisfied and the safety of the traveling public will be insured.

If you have any questions concerning these comments, please call this office or Larry Abbott, District 3 Environmental Manager in Grand Junction, 248-7223. We appreciate the opportunity to provide comments on this project.

Very truly yours,

Barbara L. S. Chocol
Manager
Project Development Branch

Attachment

COLORADO
HISTORICAL
SOCIETY

April 29, 1986

Paul Ferraro
Program Manager, UMTRAP
Office of Health Protection
Colorado Department of Health
4210 E. 11th Avenue
Denver, Colorado 80220

RE: Draft Environmental Impact Statement "Remedial Actions at the Former Climax Uranium Company Uranium Mill Site, Grand Junction, Mesa County, Colorado"

Dear Mr. Ferraro:

This office has reviewed the above document and has the following comments:

Two Road Site

6.18.4 Appendix J-6: The DEIS needs to be changed to reflect that there are two cultural resources rather than one located within this disposal site that the Department of Energy must take into consideration. Site 5ME4891 has been determined eligible to the National Register and site 5ME4890 has been determined to need further testing before a determination of eligibility can be completed. The DEIS states that no cultural resources will be impacted by disposal at the Two Road Site. A determination of effect showing how avoidance of these two sites is to be accomplished has not been completed. This must be done in consultation with the Bureau of Land Management and our office if the Two Road Site is the chosen disposal area.

Cheney Reservoir Site

6.18.3 We concur with the findings in the DEIS. However, the proposed access road may subject an area with an abundance of cultural resource sites to vandalism. The DEIS should address vandalism and how the Department of Energy will deal with it. If the Cheney Reservoir site is chosen, a determination of effect and a testing/mitigation plan must be developed for the four sites that require additional data to determine their eligibility. This is done in consultation with our office.

Vicinity Properties

6.18.9 Please note that one vicinity property to date, the Presbyterian Church (5ME4156), has been determined eligible for inclusion in the National Register of Historic

6.18.9 Places. The proposed remedial activities have been determined to have no adverse effect on the qualities of significance of the property.

Grand Junction Site

6.18.10 It is our understanding that further information to enable our office to comment on the eligibility of the Grand Junction Sugar Beet Factory/Climax Uranium Mill Site will be forthcoming in June, 1986. If the property is determined eligible, we look forward to further consultation regarding effects of the proposed action.

If this office can be of further assistance, please contact Jim Green or Kaaren Patterson at 866-3392 or 866-3395.

Sincerely,

Leslie E Wildesen

Leslie E. Wildesen
Deputy State Historic Preservation Officer

LEW/WJG:as

cc: Mary Kay High, BLM

COLORADO DEPARTMENT OF HEALTH

Richard D. Lamm
Governor

Thomas M. Vernon, M.D.
Executive Director

June 2, 1986

Mr. John G. Themelis, Project Manager
Uranium Mill Tailings Remedial Action Project Office
U.S. Department of Energy
5301 Central Avenue, N.E. - Suite 1700
Albuquerque, N.M. 87115

RE: Grand Junction Vicinity Property Impacts - Comments on DEIS, March, 1986 and the Environmental Assessment Report, February, 1986.

Dear John:

6.21.21 We have reviewed the Draft Environmental Impact Statement (DEIS), March, 1986 and a recently issued Department of Energy document entitled Environmental Assessment (EA) Remedial Actions at the Vicinity Properties Associated With the Former Climax Uranium Company Uranium Mill Site, Grand Junction, Mesa County, Colorado, February 1986. Preliminary comments were sent to you on the EA document on March 26, 1986. Both the DEIS and the EA need to further address the impacts which result from tailings deposits which now exist and the large volume of deposits which will be left in uncontrolled areas within communities of Mesa County. These deposits will consist of deposits defined as falling under the categories of: 1) supplemental standards; 2) deposits that, due to their defined volume, do not appear to exceed the EPA Standards; 3) deposits which were never identified, such as those where no known procedure or instrumentation is available to detect deposits which are at present highly shielded.

6.21.22 Our primary concern is the potential for future alpha radiation exposure through elevated radon levels in structures built over or adjacent to these residual deposits. Many of these deposits will be disturbed, moved, spread or built over (or adjacent to) as a result of normal growth and renewal processes within these communities. Experience documented in Mesa County, Rifle, and Durango in the last 14 years indicates that the likelihood of this situation occuring in the near future is great. In Mesa County alone, since 1972 the State has performed over 22,100 gamma radiation surveys on planned building sites, discovered 1273 tailings deposits in that effort, and documented over 810 privately paid-for tailings removals as a result of the ongoing Building Permit Survey Program. These removals, performed so that property owners could sell or build on land affected by tailings, were done because GJRAP and UMTRAP could not respond in a timely fashion to the immediate needs of the community. This represents an impact on a community that the DEIS and EA do not consider.

4210 EAST 11TH AVENUE DENVER, COLORADO 80220 PHONE (303) 320-8333

Mr. John G. Themelis, Project Manager
June 2, 1986
Page 2

6.21.8 The DEIS and the EA indicate that out of over 6,900 known contaminated sites, less than 4,000 will be cleaned up. A cooperative effort will be needed to control these residual deposits to prevent possible undue exposures to future occupants. What impacts will this effort have on State and local governments? What volume of tailings is projected to be left within Grand Junction and other communities after the completion of UMTRAP? (It is reasonable to expect that there will be some tens of thousands of tons of such residues.) What will be the exposure consequences of these deposits, e.g. if not controlled?

6.17.4 It is stated in the DEIS and the EA that there is no evidence that the existence of contamination affects property values or has significant adverse impacts on land use. We feel that there is more than ample evidence to indicate that land use and land values in Colorado are now affected and will continue to be affected by the presence of tailings on vicinity properties. The lending agencies of this locale can document such impacts. Costs are both real from a financial standpoint and perceived from the standpoint of injury to the image of the community. Residual contaminated deposits will continue to deter development and threaten health and economics.

We appreciate the opportunity to provide comments on these documents. We would be available to meet with you to further discuss these concerns at your convenience.

Sincerely,

Paul

Paul Ferraro, Program Manager
UMTRA Project

PF/ms

cc: Robert Holmes, Mesa County Commissioner/Chairman-Grand Junction Task Force

COMMENTS PERTAINING TO VICINITY PROPERTIES:
GRAND JUNCTION DEIS, MARCH 1986
AND
ENVIRONMENTAL ASSESSMENT FOR VICINITY PROPERTIES,
MESA COUNTY, FEBRUARY, 1986

Comment #	Page	Paragraph	Comment
1	1(1)	4(3) 6.21.3	The estimate provided of 3465 properties to be formally included into the UMTRA Program and thereby require remedial action should be updated. A figure of 3977 was listed in a January 9, 1986 transmittal from the Department of Energy.
2	1(1)	4(3) 6.21.4	Privately paid-for remedial actions are also being performed by property owners in conjunction with the Mesa County Building Permit Survey Program. Over 800 such private tailings removals have been completed to date.
3	9(4)	5(2) 6.11.11	Exposures would <u>increase</u> under the no action alternative due to the continual spread of contamination. See also comment #1.
4	10(6)	Table 1.1 6.11.12	Doesn't consider or include remedial action worker health from private tailings removals at vicinity properties. These removals will continue well into the future.
5	10(6)	Table 1.1 6.11.13	The continued exposure due to the spread of contamination is not addressed in the <u>Public Health</u> column. See comment #14.
6	10(6)	Table 1.1 6.9.9	<u>Water Resources</u> column doesn't address the effect on ground water at vicinity properties in alternative #1. There are thousands of tons of tailings around storm sewers, water lines and other utilities. See comment #16.
7	13(8)	Table 1.1 6.17.8	<u>Land Use</u> is now affected and will continue to be affected by tailings on vicinity properties. There is a major effect in that it deters development, and threatens health and economics. It should be a factor for all alternatives.
8	14(9)	Table 1.1 6.5.12	<u>Costs</u> are both real from a financial standpoint and perceived to result in injury to the image of the community. This is a factor especially in the no-action alternative but also all other alternatives as not all locations will be cleaned up. See comment #25.

Comment #	Page	Paragraph	Comment
9	16(5)	3(3,4) 6.21.6	Doesn't mention that some exposure will continue due to deposits left in uncontrolled areas and as those deposits are spread, exposures will gradually increase.
10	20(13)	4(1) 6.21.4	4th sentence - See comment #2. Add "over 800 properties have been decontaminated to some extent under the Building Permit Survey Program tailings removals."
11	22(13)	3(3) 6.24.6	The tailings pile and vicinity properties would <u>not</u> remain in their present condition (because of this dispersion by wind, erosion, uncontrolled misuse by man,...).
12	47(15)	8(1) 6.21.6	Final condition - Nothing is noted about deposits now under structures that are not being removed, but could pose a problem if the existing structure was torn down and a new tighter structure was constructed over the old deposit. This type of deposit, and others not discussed in the DEIS indicate that the last statement made in this paragraph is invalid and should therefore be omitted. See comment #25.
13	48(15)	1(2) 6.21.6	As described in greater detail in comments #17 and #25 the impacts of large volumes of contaminated mill residues left within communities of Mesa County after the completion of UMTRAP needs to be further addressed. These deposits will not be stable for even 100 years as many are being disturbed today. Property owners will be impacted by the uncontrolled movement of the contaminated materials, both from an increase in exposure as the spread of contamination continues and from deflation in property values.
14	50(5,29)	3(2,3) 6.11.14	How was the estimate of 1010 cancer deaths in 1000 years from the radiation released at vicinity properties (under the no-action alternative) derived? Were increased levels of exposure due to the continual spread of contamination taken into account in this projection? Private tailings removals would also continue at vicinity properties, which would result in additional exposures to workers.
15	53	4 6.21.3 6.11.11	See comments #1 and #3.

Comment #	Page	Paragraph	Comment
16	89(20)	6(6,7) 6.9.9	Large volumes - thousands of cubic yards - of tailings were used to bed utility lines, storm sewers, and in the lining of some irrigation ditches in Mesa County. All of these deposits have the potential to affect surface water run-off but more especially groundwater.
17	109(21)	2(6) 6.17.9	The description of impacts on land use, values, etc. is incorrect. Since 1972 the State has performed in excess of 22,150 gamma radiation surveys on planned building sites in Mesa County and has discovered over 1270 tailings deposits in that effort. Over 810 privately paid - for remedial actions have been completed on those sites. This number represents the number of vicinity property remedial actions that would have had to have been addressed at considerably greater cost and effort by either GJRAP or UMTRAP had the Building Permit Survey program not responded to this community need. This represents an impact on a community that the DEIS has not considered. The large number of removals that did not take place because the property owner couldn't afford the remedial action costs attests to the additional impact that tailings in uncontrolled areas of the county can produce. See also comments #13 and #25, and our letter dated March 26, 1986 (copy attached).
18	128	5 6.23.2	Public attitudes - 1st paragraph - The Mesa County Building Permit Survey Program has also increased public awareness of the hazards associated with tailings.
19	146(29)	1(6) 6.11.12	Ibid. Efforts to control residual contaminated deposits will result in continued exposures to remedial action workers (performing future tailings removals). Estimates should be provided of the projected health effects due to these exposures.
20	146(29)	2(3) 6.11.14	See comment #14.
21	157(30) 162(30)	1(6) 2(7) 6.8.10 6.9.9	Remedial action at vicinity properties could the potential to effect surface and ground waters. See comment #16.

Comment #	Page	Paragraph	Comment
22	169(3)	1(1) 6.17.4	Last sentence: Consistent with comments #7, #8, #13, #17, #24, and #25, it is suggested that the land values of parcels surrounding the site are noted as being currently deflated by the presence of the tailings pile.
23	169	3	3rd sentence, 2nd part - Is incorrect. See previous comments on impacts on land values.
24	171(31)	3(2) 6.21.6	This section does not take into account contaminated deposits left in uncontrolled areas. The last sentence is incorrect and fails to acknowledge the effort provided by the Building Permit Program.
25	206(1)	1(3)	Data provided in the DEIS indicates that out of well over 6,000 known contaminated vicinity sites, only less than 4,000 will be cleaned up by UMTRAP. Large volumes of contaminated deposits will be left in uncontrolled areas within communities of Mesa County. These deposits will include, among others, those tailings deposits which are undiscovered, and those which, due to their defined volume, do not appear to exceed the EPA standards. Existing instrumentation and measurement techniques are not sensitive enough to allow detection or complete identification of presently shielded or partially shielded deposits.
		6.21.8	Experience gained in Mesa County during the past 14 years indicates that many of these deposits will be disturbed, moved, spread or built over in the normal progression of renewal within the community. These tailings deposits must be controlled to ensure that the radiation exposure to the public - primarily alpha radiation exposure through elevated radon levels in structures built over or adjacent to these deposits - is not increased. This effort will continue to impact State and local governments long into the future. What is planned to mitigate these consequences?
26	207	1 6.21.9	The continual spreading of contamination in uncontrolled ways through human misuse should also be discussed.

Comment #	Page	Paragraph	Comment
27	A-7(12)	2(2) 6.21.10	The description appears to misrepresent the EPA indoor RDC standard. 40 CFR 192.12 states that "the objective of remedial action shall be, and reasonable effort shall be made to achieve...an indoor RDC not to exceed 0.02 WL". If after remedial action has been performed the indoor RDC level is between 0.02 and 0.03 WL, the implementing agencies would then consider what further action should be taken to comply with the Standard. Please see our letter to you dated March 26, 1986.

NOTE: Comments are written for DEIS with EA references in parentheses.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VIII
ONE DENVER PLACE — 999 18TH STREET — SUITE 1300
DENVER, COLORADO 80202-2413

JUN 13 1986

Ref: 8HWM-RP

Mr. John Themelis
Uranium Mill Tailings Remedial
Action Project
U.S. Department of Energy
Albuquerque Operations Office
P.O. Box 5400
Albuquerque, New Mexico 87115

Dear Mr. Themelis:

In accordance with our responsibilities under the National Environmental Policy Act the Region VIII Office of the Environmental Protection Agency has reviewed the Draft Environmental Impact Statement for remedial actions at the former Climax Uranium Company uranium mill, Grand Junction, Colorado. This review focused on the general adequacy of the proposed remedial plans for the two alternate sites - Cheney Reservoir and Two Road - for achieving compliance with the appropriate EPA standards (40 CFR Part 192).

6.2.10 Based on the information presented in the DEIS, we have concluded the implementation of the proposed remedial plan for relocation of tailings to either Cheney Reservoir or Two Road sites should produce compliance with the EPA standards for stabilized pile longevity, radon emissions, and groundwater protection. Despite the general environmental acceptability of both relocation sites, the Two Road site seems to have several advantages. That is, Two Road offers a somewhat more remote location, an absence of a continuous groundwater resource, no degradation of scenic values, and slightly less impacted acreage. The significant disadvantage is increased cost (approximately $20 million). Compliance with EPA standards and substantially lower cost does seem to be sound basis for designation the Cheney Reservoir site as the preferred option. Consistent with this overall assessments of adequacy, specific comments on the DEIS also are attached. These comments identify specific points or issues which should receive reconsideration in the preparation of the final EIS.

6.2.10 Considering the overall adequacy of the proposed remedial plan, the identification of two acceptable relocation sites, and the criteria established by EPA to rate adequacy of draft EIS's, this draft EIS is rated Category LO (lack of objections). We assume you will continue to work with State and local officials and other interested parties to achieve understanding and acceptance of a final relocation site.

Sincerely yours,

P.C. Nyberg for
Milton W. Lammering, Chief
Radiation Programs Branch

Attachment

DRAFT ENVIRONMENTAL IMPACT STATEMENT

Climax Uranium Mill Site - Grand Junction, Colorado

Page 85 - Table 4.3 EPA National Interim Drinking Water Standards

6.9.45 Since the 10 pCi/l value for natural uranium is not an EPA Interim Standard, it should not be included in the parameter list. If shown in this Table, present as a footnote. Appropriate State standards for uranium also should be presented in such a footnote.

Page 98 (Second last paragraph)

6.8.11 Interpretation of radionuclide concentrations in sediment samples require identification in terms of wet weight or dry weight. If the former, moisture content data also should be provided.

Pages 98 (Last paragraph) and 99 (First paragraph)

6.8.12 Meaningful interpretation of radium-226 results for the Colorado River require identification of these data as "total" or "dissolved" concentrations.

Page 147 - Table 5.5 Tons of uncontrolled airborne pollutants emitted for each alternative.

The data presented in this table generate a number of questions requiring clarification.

1. Particulates (fugitives) - Grand Junction

   Do the estimated emissions for the various alternatives include both contaminated and uncontaminated materials? If total, what is the estimated percentage of contaminated material in each case?

2. Particulates (fugitives) - Disposal site

   6.10.13 Same question as for (1).

3. Particulates (fugitives) - Trans. routes

   Without reading the text (page 146 - last paragraph) one might interpret these data to be losses of contaminated material during transport instead of road dust dispersed by trucks. Perhaps a footnote should be added to emphasize this point.

   Data should be included to show the estimated losses of contaminated materials during transport. Similarly, the specific control measures (water spraying material after loading, covering in trucks or trains, etc.) implemented to minimize such losses should be discussed in detail in the text.

6.10.13 Overall, experience and data gained from the relocation of the Vitro tailings pile in Salt Lake City might be useful to increasing the accuracy and validity of the estimates presented in Table 5.5.

Page 165 (First paragraph)

6.24.9 The description of the Cheney Reservoir site in this paragraph is not consistent with an earlier description on page 33. That is, the area of the stabilized pile is stated to be 80 acres on page 165, but 62 acres on page 33. Also, there is inconsistency between the stated 120 acres (total) and the stabilized pile area of 80 acres plus the 58 acres of reclaimed wildlife habitat.

$$80+58 \neq 128$$

Page 208 (First paragraph)

6.24.10 The description of the Two Road site in this paragraph is not consistent with an earlier description on page 165. On page 165, the site is described in terms of 80 acres (total) disturbed. Of this 80 acres total, the stabilized pile would cover 62 acres and represents a loss of wildlife habitat. However, the residual 18 acres would be reclaimed as wildlife habitat. Yet, the implication on page 208 is a total loss of 80 acres. Is the apparent inconsistency due to reclamation of the 18 acres for wildlife, but not the former use of low density grazing?

28

UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
URANIUM RECOVERY FIELD OFFICE
BOX 25325
DENVER, COLORADO 80225

JUL 3 0 1986

URFO:ROG
Docket No. WM-054
040WM054301E

Mr. John G. Themelis
U.S. Department of Energy
Albuquerque Operations Office
P.O. Box 5400
Albuquerque, New Mexico 87115

Dear Mr. Themelis:

We have completed our review of the Grand Junction DEIS. Specific comments are enclosed.

To summarize our review, the stabilization in place alternative appears to be the least favorable because a severe flood would completely surround the tailings pile so that there would be a very high potential for erosion. Being located in the flood plain, the tailings are saturated and hydraulically connected with the river. In addition, there is substantial evidence that channel shifts have occurred recently in the Colorado River.

The other alternatives, disposal at the Cheney Reservoir and disposal at the Two Road site, are about equal as far as NRC is concerned. The Cheney site is closer to Grand Junction, but the seismic ground acceleration (0.34 g) at the site is fairly high with respect to design of a disposal facility. At the Two Road site, the ground acceleration is only 0.18 g, but there is a greater potential for erosion due to formation of gullies. The area about 1 mile north of the Cheney Reservoir site is intensely farmed along Kannah Creek and privately owned lands lie to the north, west and south of the site. At the Two Road site, there is privately owned land only to the south of the site, about

28

- 2 - JUL 3 0 1986

3 miles away. Other than these differences, the Cheney Reservoir site and the Two Road site are about equal to each other in terms of the potential for meeting EPA standards.

Sincerely,

Edward F. Hawkins

Edward F. Hawkins, Chief
Licensing Branch 1
Uranium Recovery Field Office
Region IV

Enclosure: As stated

cc: P. Ferraro, CO Dept. of Health

NUCLEAR REGULATORY COMMISSION
URANIUM RECOVERY FIELD OFFICE

Staff Comments on the Grand Junction DEIS

I. Comments on "Volume 1-Text."

1. 6.21.3 Cover Sheet - Item e, Abstract, first paragraph: It is NRC's current understanding that cleanup at some vicinity properties may occur after remediation and stabilization of the pile. If this is the case, item "e" of the cover sheet incorrectly states that an estimated 3465 vicinity properties will be cleaned up during remedial action of the tailings pile.

2. 6.21.3 Section 3.1.1, The Grand Junction tailings and vicinity properties, page 20, last paragraph: Same comment as item 1 above regarding the vicinity properties.

3. 6.19.3 Section 4.5.3, Mineral Resources (Grand Junction site), page 77: A reference is made to a gas producing well approximately 4 miles east of the Cheney Reservoir site. This well is close enough that more information should be provided, such as depth of producing zone and production formation. Also, on page 77, reference to a borehole just west of the Grand Junction site that had an oil-show at 96.5 feet should further describe this oil-show, i.e., what formation was the show? This gas producing well is also referred to in Volume II, Section E.2.2.2, Mineral Resources (Grand Junction site), page E-18.

4. 6.11.23 Section 4.8, RADIATION, page 97, first paragraph: You state that "for purposes of this EIS, the terms roentgen and rem may be considered equivalent." To avoid confusion by the general reader, this statement may be clarified by stating that the rem and roentgen are equivalent for gamma rays only.

5. 6.11.24 Section 4.8, RADIATION, page 97, third and fourth paragraphs: In these two paragraphs, you make some general statements regarding radiation sources which people are normally exposed to and the resultant dose equivalents. Although these general statements are well known, it may be appropriate to reference their source.

6. 6.11.25 Section 4.8.1, Grand Junction, page 97: It may be instructive to compare the radioactive air particulate concentrations with unrestrictive area MPC standards. For example, Th-230

6.11.25 concentration is greater than 100 times the unrestrictive area MPC.

7. 6.24.20 Abbreviations and Acronyms: "NRC" stands for Nuclear Regulatory Commission, not Nuclear Regulatory Agency.

8. 6.24.21 List of Agencies, Organizations and Persons to whom Copies of this statement are being sent: Under Nuclear Regulatory Commission, the name Paul Hildenbrand should be changed to Raymond Gonzales.

II. Comments on "Volume II-Appendices."

1. Appendix B

a. 6.4.44 Sections B.2.6 and B.3.7, LONG TERM STABILITY (GROUND EROSION), pages B-23 and B-53: You state that, "severe rainfall events have the potential to develop rills and gullies on the steeper (20 percent) sideslopes of the stabilized tailings pile and erode some or all of the radon cover in small undefinable areas." The basis for this statement should be provided. If physical model studies have shown that a 20 percent slope is critical, the model study report should be referenced.

2. Appendices E and F

a. 6.4.45 Section E.1.4.2.2, Flood potential, page E1-18: You state that the Corps of Engineers (COE) has calculated flood flows for the Grand Junction area. In Appendix F (page F-15), you provide the peak discharges calculated by the COE for the 100-year and the 500-year floods, but not the COE's PMF peak discharge. You calculated a PMF discharge of 889,000 cfs for the Colorado River at the site. Discuss how this compares with the COE's PMF.

b. 6.9.46 Section E.2.1.2, Stratigraphy, page E-13: Section F.3.1.5, Saturated Zone Hydraulics, page F-52; and Section F.3.1.3, Stratigraphy, page F-45: The description of the stratigraphy of the Mancos Shale is very limited considering that the Mancos is the strata underlying the alluvium at the Grand Junction, the Cheney Reservoir, and the Two Road sites. The Mancos is the hydrostratigraphic unit of most concern and should therefore be more fully characterized in the text. It is necessary to characterize such strata in the vicinity of the sites to more fully understand such phenomena as the artesian zones in the Mancos described on page F-52; as well as to characterize such zones of intertonguing of the Mancos as described on page F-49 and shown in Figure F.3.7 on page F-44.

6.19.4 c. Section E.2.1.3, Structure, page E-15 and Section E.4.3.2.1, Uncompahgre Uplift, page E4-13: Some descriptions of geologic structure that are discussed in the test are not labeled in the figures. Examples include the Redlands Fault, the Jacobs Ladder Fault complex, and the Book Cliffs monocline, which are discussed in the text but are not labeled in Figures E.2.3 or E.2.4. Also, the Ridgeway Fault and Fault No. 74 discussed on page E4-13 are not shown on Figure E.4.3.3.

6.19.5 d. Section E.4.3.2, COLORADO PLATEAU PROVINCE, page E4-10: Possible ground accelerations of 0.34 g were calculated as part of the seismotectonic study for the proposed Cheney Reservoir disposal site. These values are fairly high with respect to design of a disposal facility; consequently, more information is needed to properly relate geology to faulting (fracturing) in the local Cheney Reservoir site vicinity.

6.19.6 e. Section E.4.3.2.1, Uncompahgre Uplift, page E4-12, Figure E4.3.3: The map on this figure shows potentially active faults associated with the Uncompahgre Uplift. However, the map does not adequately convey local site conditions because the map covers too large an area. A more detailed, larger-scale map is necessary to properly characterize seismotectonic activity and/or prediction at the alternative sites.

6.8.14 f. Section F.1.2.1, Grand Junction Tailings Site, (PMF hydrologic analysis), page F-21: The modified Puls method was used to route flows through primary channel reaches. This routing method which uses storage-outflow relationships is generally used for reservoir routings where it gives quite satisfactory results. For open channel routing, however, it usually gives poor approximations. Additional information is needed to describe how the modified Puls method was used to route flood flows along the Colorado River and to show that the computed flood level elevations are conservative.

6.9. g. Table F.3.4, page F-55: Several references to Table F.3.4 are made that are actually references to Table F.3.5.

6.9. h. Section F.4, POTENTIALLY AFFECTED HYDROGEOLOGIC ENVIRONMENT-CHENEY RESERVOIR SITE: Presently, there is an active irrigation operation upgradient of the proposed Cheney Reservoir site. Further information is needed to properly address the impact of irrigation recharge upon the local ground-water regime at the proposed Cheney site.

3. Appendix I

6.11.26 a. Section I.2.1, HEALTH EFFECTS OF EXPOSURE TO RADON DAUGHTERS, page I-7, last paragraph, first sentence: The units rem/hr (pCi/l) should be rem/hr/(pCi/l).

6.11.27 b. Section I.3.1, EXISTING CHARACTERISTICS AT THE GRAND JUNCTION SITE (Physical characteristics), last paragraph: A tailings emanation coefficient of 0.20 was used in Appendix I. This value was obtained from a 1979 draft NRC publication. Chapter 3 of the NRC's, "Standard Review Plan for UMTRCA Title I Mill Tailings Remedial Action Plans, U.S. Nuclear Regulatory Commission, Division of Waste Management, October, 1985," states that a reasonably conservative emanation coefficient of 0.35 is considered acceptable by the NRC staff. Therefore, until such time as measured values are available, a conservative value of 0.35 is recommended for use in the EIS.

6.11.28 c. Section I.3.1, EXISTING CHARACTERISTICS AT THE GRAND JUNCTION SITE, (Radon in air), page I-11: Explain why a windspeed of 2 m/s was used as input to the Gaussian sector average dispersion model when the DEIS on page D-3 states the average wind speed to be 8.7 mph (3.9 m/s).

6.11.29 d. Section I.5.4, HEALTH EFFECTS IN PERSPECTIVE, page I-62: This section incorrectly states the estimates of the collective dose equivalents are presented in Table I.5.4. The correct reference is Table 5.4 in Volume I.

4. Appendix K

6.17.1 a. Section K.4, IMPACTS ON LAND USE: A new reservoir (Domingues) is being planned for an area near the proposed Cheney Reservoir site. Further discussion is needed pertaining to the possible impact of this reservoir upon the proposed disposal site. Possible impacts during construction of the reservoir should also be discussed.

UNITED STATES

NUCLEAR REGULATORY COMMISSION

REGION IV

URANIUM RECOVERY FIELD OFFICE
BOX 25325
DENVER, COLORADO 80225

JUL 30 1986

URFO:ROG
Docket No. WM-054
040WM054301E

Mr. John G. Themelis
U.S. Department of Energy
Albuquerque Operations Office
P.O. Box 5400
Albuquerque, New Mexico 87115

Dear Mr. Themelis:

We have completed our review of the Grand Junction DEIS. Specific comments are enclosed.

To summarize our review, the stabilization in place alternative appears to be the least favorable because a severe flood would completely surround the tailings pile so that there would be a very high potential for erosion. Being located in the flood plain, the tailings are saturated and hydraulically connected with the river. In addition, there is substantial evidence that channel shifts have occurred recently in the Colorado River.

The other alternatives, disposal at the Cheney Reservoir and disposal at the Two Road site, are about equal as far as NRC is concerned. The Cheney site is closer to Grand Junction, but the seismic ground acceleration (0.34 g) at the site is fairly high with respect to design of a disposal facility. At the Two Road site, the ground acceleration is only 0.18 g, but there is a greater potential for erosion due to formation of gullies. The area about 1 mile north of the Cheney Reservoir site is intensely farmed along Kannah Creek and privately owned lands lie to the north, west and south of the site. At the Two Road site, there is privately owned land only to the south of the site, about

3 miles away. Other than these differences, the Cheney Reservoir site and the Two Road site are about equal to each other in terms of the potential for meeting EPA standards.

Sincerely,

Edward F. Hawkins, Chief
Licensing Branch 1
Uranium Recovery Field Office
Region IV

Enclosure: As stated

cc: P. Ferraro, CO Dept. of Health

Table 6.3 Libraries having copies of public hearing transcripts

Bendix Field Engineering Library P.O. Box 2567 Grand Junction, CO 81502
Colorado State University Documents Department, Library Fort Collins, CO 80523
Denver Public Library Energy/Env. Center 1357 Broadway Denver, CO 80210
Learning Resource Center Mesa College P.O. Box 2647 Grand Junction, CO 81502
Library, Chicago Office DOE 9800 South Cass Ave. Argonne, IL 60639
Library, Grand Junction Area Office DOE P.O. Box 2567 Grand Junction, CO 81502
Library, Idaho Office DOE 550 Second St. Idaho Falls, ID 83401
Library, National Atomic Museum DOE P.O. Box 5400 Albuquerque, NM 87115
Mesa County Library 530 Grand Ave. Grand Junction, CO 81502

REFERENCES FOR SECTION 6.0

American Public Health Association (APHA) and others, 1981. "Standard Methods for the Examination of Water and Wastewater," 15th ed. American Public Health Association, Washington, D.C.

BLM (Bureau of Land Management), 1985. Personal communication from Ron Lambeth, Biologist for Bureau of Land Management, Grand Junction, Colorado, to Steve Cox, Jacobs Engineering Group Inc., Albuquerque, New Mexico, dated May 24, 1985.

Bolwahnn, F. L., 1983. Field Supervisor, U.S. Fish and Wildlife Service, Salt Lake City, Utah, personal communication to James A. Morley, UMTRA Project Office, Albuquerque Operations Office, Albuquerque, New Mexico, dated August 8, 1983.

COE (U.S. Army Corps of Engineers), 1976. Flood Hazard Information - Colorado River and Tributaries - Grand Junction, Colorado, Corps of Engineers, Sacramento, California.

DOE (U.S. Department of Energy) 1986a. Draft Remedial Action Plan and Site Conceptual Design for Stabilization of the Inactive Uranium Mill Tailings at Grand Junction, Colorado, prepared by the U.S. Department of Energy, UMTRA Project Office, Albuquerque Operations Office, Albuquerque, New Mexico.

DOE (U.S. Department of Energy) 1986b. Technical Summary of the UMTRA Project Technology Development Program, UMTRA/DOE-AL-200125.0000, prepared by the U.S. Department of Energy, UMTRA Project Office, Albuquerque Operations Office, Albuquerque, New Mexico.

DOE (U.S. Department of Energy) 1986c. "Biological Assessment for the Two Road Alternate Disposal Site at the Former Climax Uranium Company Uranium Mill Site, Grand Junction, Mesa County, Colorado," prepared by the U.S. Department of Energy, UMTRA Project Office, Albuquerque Operations Office, Albuquerque, New Mexico.

DOE (U.S. Department of Energy) 1986d. Environmental Assessment of Remedial Action at the Vicinity Properties Associated with the Former Climax Uranium Company Uranium Mill Site, Grand Juncton, Mesa County, Colorado, prepared by the U.S. Department of Energy, UMTRA Project Office, Albuquerque Operations Office, Albuquerque, New Mexico.

DOE (U.S. Department of Energy) 1984. Final Environmental Impact Statement of Remedial Actions at the Former Vitro Chemical Company Site, South Salt Lake, Salt Lake County, DOE/EIS-0099-F, prepared by the U.S. Department of Energy, UMTRA Project Office, Albuquerque Operations Office, Albuquerque, New Mexico.

DOE (U.S. Department of Energy), 1983. "Biological Assessment Related to Remedial Action at the Grand Junction and Rifle Sites," prepared by the U.S. Department of Energy, UMTRA Project Office, Albuquerque Operations Office, Albuquerque, New Mexico.

EPA (U.S. Environmental Protection Agency), 1983a. Standards for Remedial Action at Inactive Uranium Processing Sites, Federal Register Vol. 48, No. 3, January 5, 1983.

EPA (U.S. Environmental Protection Agency), 1983b. Environmental Standards for Remedial Action and Thorium Mill Tailings at Licensed Commercial Processing Sites; Final Rule, Federal Register Vol. 48, No. 196, October 7, 1983.

EPA (U.S. Environmental Protection Agency), 1974. Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety, EPA 550/9-74-004, Washington, D.C.

Hem, J. D., 1985. "Study and Interpretation of Chemical Characteristics of Natural Water," United States Geological Survey, Water-Supply Paper 2254, Alexandria, Virginia.

Kessler et al. (F. M. Kessler, P. D. Schomar, P. C. Shanaud, and E. Rosendahl), 1978. Construction Site Noise Control Cost-Benefit Estimation Technical Background, prepared by the U.S. Army Corps of Engineers, Construction Engineering Research Laboratory Technical Report N-37, Champaign, Illinois.

Kirkham, R. M., and W. P. Rogers, 1981. "Earthquake Potential in Colorado: A Preliminary Evaluation," Colorado Geological Survey Bulletin, No. 43.

Markos, G., and K. J. Bush, 1983a. "Geochemical Investigation of UMTRAP Designated Site at Grand Junction, Colorado," prepared by Geochemistry and Environmental Chemistry Research, Inc., Rapid City, South Dakota, for the U.S. Department of Energy, UMTRA Project Office, Albuquerque Operations Office, Albuquerque, New Mexico.

Markos, G., and K. J. Bush, 1983b. "Data for the Geochemical Investigation of UMTRAP Designated Site at Grand Junction, Colorado," prepared by Geochemistry and Environmental Chemistry Research, Inc., Rapid City, South Dakota, for the U.S. Department of Energy, UMTRA Project Office, Albuquerque Operations Office, Albuquerque, New Mexico.

Metzner, C., 1984. Director of City Planning, Grand Junction, Colorado, personal communication to Chris Nagel, Jacobs Engineering Group Inc., Pasadena, California.

NRC (U.S. Nuclear Regulatory Commission), 1985. Standard Review Plan for UMTRCA Title I Tailings Remedial Action Plans, Division of Waste Management, Washington, D.C.

ORNL (Oak Ridge National Laboratory), 1980. Assessment of the Radiological Impact of the Inactive Uranium Mill Tailings at Grand Junction, Colorado, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

URS (URS Corporation), 1983. "Salinity Investigation of the Glenwood-Dotsero Springs Units," URS Corporation, Denver, Colorado.

GLOSSARY

absorbed dose, radiological	Radiation energy absorbed per unit mass, usually given in units of rads.
aggradation	The building up of the Earth's surface by deposition; specifically the upbuilding performed by a stream in order to establish or maintain uniformity of grade or slope.
alluvium	Sediment deposited by a flowing river.
alpha particle	A positively charged particle emitted from certain radionuclides. It is composed of two protons and two neutrons, and is identical to the helium nucleus.
animal unit month (AUM)	The amount of feed or forage required by one mature cow and calf for one month.
anisotropy	A variation in the general water flow direction within an aquifer. Water in an anisotropic aquifer may not flow parallel to the hydraulic gradient.
anthropogenic	Man-made.
aquifer	A subsurface formation containing sufficiently saturated permeable material to yield usable quantities of water.
artesian	Artesian is synonymous with confined. See "ground water, confined."
atom	A unit of matter; the smallest unit of an element consisting of a dense, central, positively charged nucleus surrounded by a system of electrons, equal in number to the number of nuclear protons and characteristically remaining undivided in chemical reactions except for a limited removal, transfer, or exchange of certain electrons.
A-weighted scale	Sound pressure level scale which most closely matches the response of the human ear. This scale is most commonly used to measure environmental noise and is often supplemented by the time and duration of the noise to determine the total quantity of sound affecting people.
background radiation	Radiation arising from radioactive material other than that under consideration. Background radiation due to cosmic rays and natural radioactivity is always present, and there is always background radiation due to the presence of radioactive substances in building materials, and the like.
beta particle	Charged particle emitted from the nucleus of an atom during radioactive decay, with mass and charge equal to those of an electron.

bioassay	A method for quantitatively determining the concentration of radionuclides in a body by measuring the quantities of those radionuclides that are eliminated from the body, usually in the urine or the feces.
Class I to III archaeological surveys	Relates to an archaeological investigation of probable occurrence of cultural resources within a given locale. A Class I survey is a literature search for predetermined archaeological features of historic significance; a Class II survey is a combination of a literature review and a partial but cursory excavation of an area to determine the presence of cultural resources; a Class III survey is an in-depth inspection of an area to determine the presence of archaeological materials where the likelihood of their occurrence is high, based on the history of the area.
colluvium	Weathered geologic material transported by gravity.
confined aquifer	An aquifer bounded above and below by relatively impermeable rock layers.
confining bed	Confining bed is defined as a body of "impermeable" material stratigraphically adjacent to one or more aquifers. In nature, however, its hydraulic conductivity may range from nearly zero to some value distinctly lower than that of the aquifer.
contamination	In this report, the presence of radioactive material in concentrations above natural levels.
curie (Ci)	The unit of radioactivity of any nuclide, defined as precisely equal to 3.7×10^{10} disintegrations per second.
daughter product(s)	A nuclide resulting from radioactive disintegration of a radionuclide, formed either directly or as a result of successive transformations in a radioactive series; it may be either radioactive or stable.
decay, radioactive	Disintegration of the nucleus of an unstable nuclide by spontaneous emission of charged particles, photons, or both.
decontamination	The reduction of radioactive contamination from an area to a predetermined level set by a standards-setting body such as the EPA, by removing the contaminated material.
disintegrations per minute or second	The number of radioactive decay events occurring per minute or second.
disposal	The planned, safe, permanent placement of radioactive waste.
dose	A general term denoting the quantity of radiation or energy absorbed, usually by a person; for special purposes, it must be qualified; if unqualified, it refers to absorbed dose.

dose, absorbed	The amount of energy imparted to matter by ionizing radiation per unit mass of irradiated material at the point of interest; given in units of rads.
dose commitment	The cumulative dose equivalent that results and will result from exposure to radioactive materials over a discrete time period; given in units of rems.
dose equivalent	The quantity that expresses all kinds of radiation on a common scale for calculating the effective absorbed dose; defined as the product of the absorbed dose in rads and modifying factors, especially the qualifying factor; given in terms of rems. Often abbreviated "dose."
endemic	Belonging to or native to a locality or region.
escarpment	A steep face terminating high lands abruptly, a cliff.
exposure	The presence of gamma radiation that may deposit energy in an individual; given in units of roentgens.
external dose	The absorbed dose that is due to a radioactive source external to the individual as opposed to radiation emitted by inhaled or ingested sources.
fault	A surface or zone of rock fracture along which there has been movement.
floodplain	Lowland or relatively flat areas that are subject to flooding. A 100-year floodplain has a one percent or greater probability of flooding in any given year.
flux, radon	The emission of radon gas from the earth or other material, usually measured in units of picocuries per square meter per second.
gamma	A high energy and deep penetrating form of radiation.
gamma dose	Radiation dose caused by gamma radiation.
gamma logging (or logs)	A technique for determining gamma radiation levels at various depths in a bore hole.
gamma ray	High energy electromagnetic radiation emitted from some radiation radionuclides. The energy levels are specified for different radionuclides.
gamma spectral analysis (gamma spectroscopy)	An analytical technique for identifying radionuclides based on their different gamma energy levels.
grazing allotment	An entitlement given by a government agency or Indian tribe to a person or persons to use a specified parcel of land for the grazing of livestock.
ground water	Water below the land surface, generally in a zone of saturation.

ground water, confined — Confined ground water is under pressure significantly greater than atmospheric, and its upper limit is the bottom of the bed of distinctly lower hydraulic conductivity than that of the material in which the confined water occurs.

ground water, unconfined — Unconfined ground water is water in an aquifer that has a water table.

half-life — The time required for 50 percent of the quantity of a radionuclide to decay into its daughters.

head — When used alone, it is understood to mean static head. The static head is the height above a standard datum of the surface of a column of water (or other liquid) that can be supported by the static pressure at a given point.

head, total — The total head of a liquid at a given point is the sum of three components: (1) elevation head, h_e, (2) pressure head, h_p, and (3) velocity head, h_v. Under conditions to which Darcy's Law may be applied, the velocity of ground water is so small that the velocity head, $h_v = v^2/2g$, is negligible.

health effect — Adverse physiological response from radiation exposure (in this report, one health effect is defined as one cancer death from exposure to radioactivity).

hydraulic conductivity — The volume of water at the existing kinematic viscosity that will move in unit time under a unit hydraulic gradient through a unit area measured at right angles to the direction of flow.

hydraulic gradient — The change in static head per unit of distance in a given direction.

inert gas — One of the chemically unreactive gases: helium, neon, argon, krypton, xenon, and radon.

in-situ — In the natural or original position.

internal dose — The absorbed dose or dose commitment resulting from inhaled or ingested radioactivity.

isotopes — Nuclides having the same number of protons in their nuclei, but differing in the number of neutrons; the chemical properties of isotopes of a particular element are almost identical.

isotropy — That condition in which all significant properties are independent of direction.

leachate — Leachate is the solution generated by the percolation of water through a body of soil, waste rock, or solid waste.

licensing	In this report, the process by which the NRC will, after the remedial actions are completed, approve the final disposition and controls over a disposal site. It will include a finding that the site does not and will not constitute a danger to the public health and safety.
maintenance, custodial (passive)	The repair of fencing, the repair or replacement of monitoring equipment, revegetation, minor additions to soil cover, and general disposal site upkeep such as mowing grass.
man-rem	Unit of population exposure obtained by summing individual dose-equivalent values for all people in the population. Thus, the number of man-rems attributed to one person exposed to 100 rems is equal to that attributed to 100 people each exposed to one rem.
mass wasting	The slow downslope movement of rock debris (due to gravity).
micro	A prefix meaning one millionth (x 1/1,000,000 or 10^{-6}).
milli	A prefix meaning one thousandth (x 1/1000 or 10^{-3}).
Modified Mercalli (scale)	A standard scale for the evaluation of the local intensity of earthquakes based on observed phenomena such as the resulting level of damage. Not to be confused with magnitude, such as measured by the Richter scale, which is a measure of the comparative strength of earthquakes at their sources.
monitor	To observe and make measurements to provide data for evaluating the performance and characteristics of the disposal site.
National Register of Historic Places	Established by the Historic Preservation Act of 1966. The Register is a listing of archaeological, historical, and architectural sites nominated for their local, state, or national significance by state and Federal agencies and approved by the Register staff.
nuclide	A general term applicable to all atomic forms of the elements; nuclides comprise all the isotopic forms of all the elements. Nuclides are distinguished by their atomic number, atomic mass, and energy state.
orographic	Pertaining to mountains, especially in regard to their location and distribution.
passive institutional controls	Those controls which preclude human contact with the waste or require a continuing social order. Examples include Federal ownership of a disposal site, monuments on the site, records with agencies, and physical barriers (e.g., riprap covers, vegetation, waste burial).
perched ground water	Ground water separated from an underlying body of ground water by unsaturated rock.

permeability	The ease with which liquids or gases penetrate or pass through a layer of soil. Technically, it is the volume of fluid that will flow through a unit area under a unit hydraulic gradient, measured in centimeters per second or equivalent units.
permissible dose	That dose of ionizing radiation that is considered acceptable by standards-setting bodies such as the EPA.
person-rem	Same as man-rem.
pico	A prefix meaning one trillionth (1 x 1/1,000,000,000,000 or 10^{-12}).
picocurie	A unit of radioactivity defined as 0.037 disintegrations per second.
piezometric surface	The potentiometric surface of an aquifer. This represents the pressure exerted on a confined aquifer, or the water table in an unconfined aquifer.
pit run rock	Rock materials (sometimes with a rock diameter specification) that are not screened for size segregation prior to use in the construction industry.
porosity	The porosity of a rock or soil is its property of containing interstices or voids and may be expressed quantitatively as the ratio of the volume of its interstices to its total volume. Also called total porosity.
porosity, effective	Effective porosity refers to the amount of interconnected pore space available for fluid transmission.
potentiometric surface	The potentiometric surface is a surface which represents the static head.
primary succession type	A plant that colonizes an area not previously covered by vegetation.
Probable Maximum Flood (PMF)	The hypothetical flood (peak discharge, volume, and hydrograph shape) that is considered to be the most severe reasonably possible, based on comprehensive hydrometeorological application of Probable Maximum Precipitation (PMP) and other hydrologic factors favorable for maximum flood runoff such as sequential storms and snowmelt.
Probable Maximum Precipitation (PMP)	The estimated depth for a given duration, drainage area, and time of year for which there is virtually no risk of exceedence.
quality factor (QF)	The principal modifying factor by which absorbed doses are multiplied to obtain dose equivalents for radiation-protection purposes and thus express the effectiveness of absorbed doses on a common scale for all kinds of ionizing radiation. The quality factor depends on the type and the energy of the radiation being considered.

proton	An electrically positive elementary particle found in the nucleus of an atom. Also, the nucleus of a hydrogen atom.
rad	A unit of measure for the absorbed dose of radiation. It is equivalent to 100 ergs per gram of material.
radioactive decay chain	A succession of nuclides, each of which transforms by radioactive disintegration into the next until a stable nuclide results.
radioactivity (radioactive decay)	The property of some nuclides of spontaneously emitting particles or gamma radiation or of spontaneous fission.
radioisotope	A radioactive isotope of an element with which it shares almost identical chemical properties.
radionuclide	A radioactive nuclide.
radium-226	A radioactive daughter product of uranium-238. Radium is present in all uranium-bearing ores; it has a half-life of 1620 years.
radon-222	The gaseous radioactive daughter product of radium-226; it has a half-life of 3.8 days.
radon-daughter product	One of several short-lived radioactive daughter products of radon-222. All are solids.
range type	A distinctive kind of rangeland that has a certain potential for producing rangeland plants. Each type has its own combination of environmental conditions and characteristic plant communities.
recharge	Resupply, replenish.
rem	A unit of dose equivalent equal to the absorbed dose in rads times quality factor times any other necessary modifying factor. It represents the quantity of radiation that is equivalent in biological damage to one rad of x-rays.
Richter magnitude	A measure of the total energy released by an earthquake.
roentgen	A unit of measure of ionizing radiation in air; one roentgen in air is approximately equal to one rad and one rem in tissue.
secular equilibrium	The condition of a radionuclide decay chain in which the rate of decay of any radioactive product is just equal to its production from the previous member of the chain.
sheet piling	Closely spaced piles (or posts) of wood, steel, or concrete driven vertically into the ground to obstruct lateral movement of earth or water, and often to form an integral part of the permanent structure.

soldier piling — H-shaped piles driven with the flanges parallel to the sides of the excavation, used when portions of the vertical face of the excavation can be exposed without danger of collapse. Horizontal logging may be used to connect adjacent piles to ensure stable excavation faces.

slimes — In this report, fine-grained waste materials from uranium-ore processing that are mixed with small amounts of water.

soil infiltration rate — The rate at which water enters the soil surface moves vertically.

soil percolation rate — The rate at which water moves through soil in all directions.

solifluction — The slow viscous downslope flow of waterlogged soil and other unsorted and saturated surficial material. Especially the flow occurring at high elevations in regions underlain by frozen ground that acts as a downward barrier to water percolation.

stabilization — The reduction of radioactive contamination in an area to a predetermined level by a standards-setting board such as the EPA, by encapsulating or covering the contaminated material.

storage coefficient — The storage coefficient is the volume of water an aquifer releases from or takes into storage per unit surface area of the aquifer per unit change in head.

surveillance — The observation of the disposal site for purposes of visual detection of need for custodial care, evidence of intrusion, and compliance with other license regulatory requirements.

tailings, uranium-mill — The wastes remaining after most of the uranium has been extracted from uranium ore.

thorium-230 — A radioactive-daughter product of uranium-238; it has a half-life of 80,000 years and is the parent of radium-226.

transmissivity — Transmissivity is the rate at which water of the prevailing kinematic viscosity is transmitted through a unit width of the aquifer under a unit hydraulic gradient.

UMTRA Project — Uranium Mill Tailings Remedial Action Project of the U.S. Department of Energy.

unconfined aquifer — An aquifer without an upper confining layer. Also known as phreatic or water-table aquifers.

uranium-238 — A naturally-occurring radioisotope with a half-life of 4.5 billion years; it is the parent of uranium-234, thorium-230, radium-226, radon-222, and others.

vicinity property	A property in the vicinity of the Grand Junction site that is determined by the DOE, in consultation with the NRC, to be contaminated with residual radioactive material derived from the Grand Junction site, and which is determined by the DOE to require remedial action.
water table	The surface of a body of unconfined ground water at which pressure is equal to that of the atmosphere.
working level (WL)	A measure of radon-daughter-product concentrations. Technically, it is any combination of short-lived radon decay products in one liter of air that will result in the ultimate emission of alpha particles with a total energy of 130,000 MeV.
working-level month (WLM)	The exposure resulting from inhalation of air with a month (WLM) concentration of one WL for 170 working hours. Continuous exposure of a member of the general public to one WL for one year results in approximately 53 WLM.
zone, unsaturated	The unsaturated zone is the zone between the land surface and the deepest water table.

ABBREVIATIONS AND ACRONYMS

AEC	U.S. Atomic Energy Commission
ANL	Argonne National Laboratory, Argonne, Illinois
AQCR	Air Quality Control Region
BEIR	Advisory Committee on the Biological Effects of Ionizing Radiation of the National Academy of Sciences (also their report)
BFEC	Bendix Field Engineering Corporation, Grand Junction, Colorado
BLM	Bureau of Land Management, U.S. Department of the Interior
CFR	Code of Federal Regulations
CGS	Colorado Geological Survey
cm/sec	Centimeters per second
CNHI	Colorado Natural Heritage Inventory
CO	Carbon monoxide
COE	U.S. Army Corps of Engineers
Cy	Cubic yard
dBA	Decibels on the A scale; a logarithmically based unit of sound intensity weighted to account for human auditory responses
DEIS	Draft Environmental Impact Statement
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
EGR	External gamma radiation
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
FBDU	Ford, Bacon, and Davis, Utah, Inc.
FEMA	Federal Emergency Management Agency
FR	Federal Register
g	Grams, a unit of weight = 0.035 ounce; also a measure of acceleration, 1 g = 32 feet per squared second
GJRAP	Grand Junction Remedial Action Program

gpm	Gallons per minute
HC	Hydrocarbon
JEG	Jacobs Engineering Group Inc.
km	Kilometer
kw	Kilowatt
kwh	Kilowatt-hours
l	Liter; a unit of volume = 1.057 quarts
LLD	Lower limit of detection
L_{dn}	Day-night sound level, measured in decibels
L_{eq}	Equivalent sound level, measured in decibels
m	Meter, a unit of length = 3.28 feet; also milli, a prefix meaning one-thousandth (10^{-3})
MCE	Maximum Credible Earthquake
MeV	Million electron volts
micro	Micro, a prefix meaning one-millionth (10^{-6})
mg	Milligrams; a thousandth of a gram
mgd	Million gallons per day
MILDOS	A computer code used to calculate both the spread of radon and particulates in the atmosphere and the consequent radiation doses
MMI	Modified Mercalli Intensity; a measure of earthquake intensity
MPC	Maximum permissible concentration
mR/hr	Milliroentgens per hour
MSE	Mountain States Engineers, a Division of Mountain States Mineral Enterprises, Inc., Tucson, Arizona
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act of 1969 (PL91-190)
NOAA	National Oceanic and Atmospheric Administration
NO_2	Nitrogen dioxide
NO_x	Nitrogen oxides
NPDES	National Pollutant Discharge Elimination System

NRC	U.S. Nuclear Regulatory Commission
NRHP	National Register of Historic Places
O_3	Ozone
ORNL	Oak Ridge National Laboratory, Oak Ridge, Tennessee
p	Pico, a prefix meaning one trillionth (10^{-12})
Pb	Lead
pCi/g	Picocuries per gram
pCi/l	Picocuries per liter
pH	A logarithmic scale of hydrogen-ion concentration, and hence, an indication of acidity or alkalinity; pH = 7 is neutral; pH less than 7 is acidic; pH greater than 7 is alkaline
PMF	Probable Maximum Flood
PMP	Probable Maximum Precipitation
PSCR	Processing Site Characterization Report
RAC	Remedial Action Contractor
Ra-226	Radium-226
RDC	Radon-daughter concentration
Rn-222	Radon-222
SCS	Soil Conservation Service, U.S. Department of Agriculture
SHPO	State Historic Preservation Officer
SO_2	Sulfur dioxide
TAC	Technical Assistance Contractor
TDS	Total dissolved solids
Th-230	Thorium-230
TLD	Thermoluminescent dosimeter; a device for measuring radiation
TOC	Total organic carbon
TSP	Total suspended particulates
TSS	Total suspended solids
UBC	Uniform Building Code

U-234	Uranium-234
U-235	Uranium-235
U-238	Uranium-238
U_3O_8	Uranium oxide, also called yellowcake
UMTRA	Uranium Mill Tailings Remedial Action
UMTRCA	Uranium Mill Tailings Radiation Control Act of 1978 (PL95-604)
USDA	U.S. Department of Agriculture
USDC	U.S. Department of Commerce
USF&WS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WD	Wind direction
WL	Working level (a measure of radon-daughter-product concentration)
WLM	Working-level month (exposure to one WL for 170 hours)
$\overline{X}$	Mean (average value of the variable)

LIST OF PREPARERS OF THIS STATEMENT

Person	Organization	Responsibility
Marc Nelson	Jacobs-Weston	NEPA Management/Vicinity Properties
Dave Lechel	Jacobs-Weston	Manager, Environmental Services
Raoul Portillo	Jacobs-Weston	Engineering/Surface Water
Bill Knight	Jacobs-Weston	Engineering
Leon Stepp	Jacobs-Weston	Site Management
Phil Stassi	Jacobs-Weston	Site Management
Denise Bierley	Jacobs-Weston	Geology/Soils/Cultural Resources
Steve Cox	Jacobs-Weston	Biology
Mark Pingle	Jacobs	Land Use/Socioeconomics/ Transportation
Steve Green	Jacobs-Weston	Radiation
John Price	Sergent, Hauskins & Beckwith	Ground water
Ron Rager	Sergent, Hauskins & Beckwith	Geotechnical
John Themelis	Department of Energy	Project Management
John Arthur	Department of Energy	NEPA Management
Mark Jackson	Jacobs-Weston	Vicinity Properties
Carol Meyer	Jacobs-Weston	Technical Editor
Arrie Bachrach	Jacobs	Socioeconomics and Land Use
Gail Sutton	Jacobs-Weston	Assistant Technical Editor
Steve Byers	Jacobs	Air Quality/Noise
Gary Meunier	Jacobs	Air Quality/Noise
Tom Melancon	State of Colorado Division	Socioeconomics of Local Government
Jim Goepel	Jacobs	Air Quality
Mike Webb	Jacobs	Air Quality
Alan Owen	Sergent, Hauskins & Beckwith	Surface Water
Eric Banks	Sergent, Hauskins & Beckwith	Geotechnical

AGENCIES AND PERSONS CONSULTED DURING THE PREPARATION OF THIS STATEMENT

Colorado Dept. of Health, Water Quality Control Division, Denver: Dick Bowman.

Grand Junction Fire Department: Jim Campbell, Operations Chief.

Grand Junction Police Department: Robert Evers.

Grand Junction Public Works Department: John Kenney, Acting Director.

U.S. Bureau of Land Management, Grand Junction: Cathy Logan-Pearce, Realty Specialist.

Grand Junction, Director of City Planning: Carl Metzner.

U.S. Bureau of Reclamation, Glenwood-Dotsero Springs Unit, Grand Junction: Nick Mezei, Planning Team Leader.

Grand Junction City Engineer.

Mesa County Engineer, Grand Junction.

Mesa County Sheriff's Department.

Association of Local Governments, Rifle: Dave Norman.

Colorado State Patrol, Denver: Lou Smith, Statistical Analyst.

Mesa County Policy and Research Office, Grand Junction: Charles Trainor, Transportation Planner.

U.S. Bureau of Labor Statistics, Los Angeles Regional Office.

Mesa County Road Department, Grand Junction: Bob Carmen, Engineering Supervisor.

Mesa County Assessor's Office, Grand Junction.

United Bank of Grand Junction: Ron Razga.

Grand Junction City Auditor: Larry Cleaver.

Colorado Division of Employment and Training, Denver: Marvin H. Wajah.

Mesa County Finance Department: Jack Morgan.

Bureau of Land Management, Moab, Utah.

Soil Conservation Service, Grand Junction, Colorado.

Colorado Division of Wildlife, Denver, Colorado.

U.S. Fish and Wildlife Service, Grand Junction, Colorado.

AGENCIES AND PERSONS CONSULTED (Continued)

Colorado State Historic Preservation Officer, Denver, Colorado.

U.S. Bureau of Land Management, Grand Junction, Colorado.

Bendix Field Engineering Corporation, Grand Junction, Colorado.

U.S. Bureau of Reclamation, Grand Junction, Colorado.

U.S. Environmental Protection Agency, Denver, Colorado.

U.S. Nuclear Regulatory Commission, Washington, D.C.

LIST OF AGENCIES, ORGANIZATIONS, AND PERSONS TO WHOM COPIES OF THIS STATEMENT ARE BEING SENT

FEDERAL AGENCIES

Department of Interior

Bureau of Land Management

Ralph Spangler, Denver, Colorado
Jim Dean, Denver, Colorado
District Manager, Grand Junction, Colorado
Doris Chelius, Denver, Colorado
Steve Moore, Grand Junction, Colorado
Julia Dougan, Grand Junction, Colorado

Fish and Wildlife Service

Bill Kurey, Grand Junction, Colorado
Bill Martin, Denver, Colorado
Robert McCue
Robert Ruesink
Rick Krueger
Robert Smith

Policy and Budget Administration

Cecil Hoffman, Washington, D.C.

Environmental Projects Review

Bruce Blanchard

Department of Justice

L. Wallace, Washington, D.C.

Veterans Administration

Ralph Ham, Denver, Colorado

Department of Housing and Urban Development

James Christopolous
Robert Matuschek

U.S. Army Corps of Engineers

District Engineer, Sacramento, California
Gerald Broyles, Omaha, Nebraska
Art Champ, Grand Junction, Colorado

Office of Management and Budget

Richard Brozen, Washington, D.C.

Oak Ridge National Laboratory

E. Lee Keller, Oak Ridge, Tennessee

Nuclear Regulatory Commission

Raymond Gonzales, Denver, Colorado
Dale Smith, Golden, Colorado
Leo Higginbotham, Washington, D.C.
Dan Martin, Washington, D.C.
Edward Hawkins

Environmental Protection Agency

Milt Lammering, Denver, Colorado
Stanley Lichtman, Washington, D.C.
Marvin Rubin, Washington, D.C.
Marion Mlay, Washington, D.C.
William Geise, Denver, Colorado
Philip Nyberg, Denver, Colorado
John Yeagley, Denver, Colorado

STATE AGENCIES

Colorado Attorney Generals Office

Adonis Neblett
Lawrence DeClairg
Rick Griffith
Joe Montoya

Colorado Geological Survey

John Rold

Colorado Science and Technical Advisory Council

Leonard Slosky

Colorado Department of Health

Paul Ferraro
Albert Hazle
Robert Gonring
Warren Jacobi
Dick Gamewell
Tom Looby
Bud Franz

Colorado Department of Natural Resources

Rahe Junge

Colorado Division of Disaster and Emergency Services

John Byrne

Colorado Office of Surface Mining

Dwight Araki

Colorado State Clearinghouse

Val Tungseth

Utah Department of Health and Radiation

Larry Anderson

COUNTY AND CITY AGENCIES

City/County Attorney

Gerald J. Ashby

City Manager

Mark Achen
Gordon Tiffany

County Administrator

Curt Wiedeman

Director, Comprehensive Planning

Daryll Schrumm

Director, Environmental Health

Chuck Millhollend

District Attorney

Terence Farina

Emergency Planning Council

Vickie Anderson

Grand Junction Planning and Zoning

Rebecca Frank
Karl Metzer

Mesa County Engineering Coordinator

Joe Crocker

Mesa County Floodplain Board

Ed Armstrong

Mesa County Planning Commission

Linda Allen
Charles Cardillo
Paul Nelson
Tallie Miller

Floodplain Administrator

H. Keith Corey

Grand Junction City Council

Paul Nelson
James Leland
Reford Theobold
Gary Lucero
Raymond Phipps

Mayor

Stephen Love

Mesa County Board of Commissioners

Maxine Albers
Robert Holmes
Richard Pond

Mesa County Health Department

Steve De Feyder
Thomas Donville

Road Supervisor

Terry Sommerfeld

Street Superintendent

Doug Cline

City of Grand Junction

J. Don Newton

ELECTED OFFICIALS

Senator William Armstrong, Washington, D.C. Office
Kathy Hall, Grand Junction Office

Senator Gary Hart, Washington, D.C. Office
Daniel Prinster, Grand Junction, Colorado

Governor of Colorado Richard D. Lamm
    Mary Whitman

Colorado Secretary of State Mary Buchanan
    Shirley Woodrow, Grand Junction, Colorado
    Jim Huska, Washington D.C.
    Ann Powers, Grand Junction, Colorado

Congresswoman Patricia Schroeder
Congressman Mike Strang
Congressman Ken Kramer

    Washington D.C. Office
    Mirian Carter, Colorado Springs, Colorado

Colorado State Senator Tilman N. Bishop
Colorado State Senator Dan Noble

Colorado State Representative Ed Carpenter

ORGANIZATIONS

American Mining Congress
    Larry Boggs

Anaconda Minerals
    Dr. Richard Krablin

Argee Corporation
    Suzanne Stewart

Atlas Minerals
    Richard Blubaugh

Batelle
    J. Ballord

Bendix
    Alan Chapman
    G. Harold Langner, Jr.

Bill's Body Shop
    Bill Jarvis

Black Hills Alliance

Castings, Inc.
R.G. Sullivan

Central Grand Valley Sanitation District
Randy Booth

CH2M Hill
Mary Jo Vobejda

Citizens for Safe Energy

Club 20
Bill Cleary

C.O.S.C. Conservator
Carolyn Hales

Colorado Audubon Society

Colorado Commission of Indian Affairs
Tracey Cox

Colorado Leader
Editor

Colorado Open Space Council

Colorado Statesman
News Editor

Congressional Information Service
Phyllis Lkum

Cother Corporation
Tim Smith

Daily Journal
News Editor

Danielson and Euser
Luke J. Danielson

Denver Audubon Society
Walter Keshe

Dominguez Dam Project
Louis Brach
M. O. Brown

Environmental Action, Inc.

Environmental Center

Environmental Defense Fund
James Martin

Environmental Policy Center
Dave Berick

Environmental Research Group
Robert B. Lewis

Exxon Minerals
James Gilchrist

Finley Contracting Company
Don Finley

Friends of the Earth
Connie Albrecht
Jim Harding

Future
Margaret Puls

GECR, Inc.
Kathryn Bush

Grand Junction Daily Sent.
News Editor

Grand River Institute
Dani Langdon

H and H Drilling and Blasting
Keith Hanna

HACO Exploration
Chuck Hajek

Herald Dispatch
Editor

High Country Citizens Alliance

High Country News

Homestake Mining
Ed Kennedy

Huerfano Valley Citizen Alliance

Illinois Department of Nuclear Safety
Stephen W. Seiple

International Engineering Company, Inc.
Edwin S. Smith

KAAT
News Director

KAZY-FM
Program Director

KBPI-FM
General Manager

KBTV-TV
News Director

KCFR-FM
News Director

KDEN
News Director

KHOW-AM
News Director

KJCT-TV
News Director

KIMN-AM/KIMN-FM
News Director

KLAK-AM
Program Director

KLZ-AM
News Director

KMGH-TV
Planning Editor

KOSI-FM
News Director

KPPL-FM
Program Director

KREX-TV
News Director

KRKS-AM/KLIR-FM
News Director

KRMA-TV
Program Manager

KSTR-News
Dana Nunn

KTLK-AM
News Director

KWBZ-AM
News Director

KWGN-TV
News Director

Kerr-McGee Corporation
James Cleveland

MCEDC - EBS
Dave McGuiness

Mesa Federal Savings and Loan
Patrick Gormley

Mesa Rock Company
John Schmahl

Monoghan and Associates, Inc.
Mary Whitman
James Monoghan

Monsanto Research
Cliff Rudy

Montrose Bureau Daily Sentinel
Nancy Lofholm

Morrison-Knudsen
Jim Oldham

National Audubon Society

National Wildlife Federation

Natural Resources Defense Council

New Energy Technology
Charles Hook

ORAU
Jim Berger

Protect Our Mountain Environment
John Klug

Public Lands Institute
Carolyn Johnson

ORGANIZATIONS (Continued)

Public Service of Colorado
John Muir

RA Consultants, Inc.
Hoyt Mitchell

Railfax
Donna Davis

Rocky Mountain JIHO
Editor

Rocky Mountain News

SAIC
Don Wilkes

San Juan Basin Health Unit

Sandia National Labs
Melvin Merritt

Sentinel Newspapers
Editor

Sergent, Hauskins and Beckwith

Sierra Club
Brooks Yeager
John Thomas

Sorter Construction Company
Bill Sorter

Southwest Research Information Center

St. Mary's Hospital
Dr. Geno Saccamano

Roy F. Weston, Inc.
Dr. Ben Tencer
Dr. Fred Thompson

UMETCO Minerals
J. F. Frost

Viking Systems International
Lydia Detman

Wildlife Society-Colorado Chapter
John Schmidt

Williams, Turner and Holmes
Jane Barnes

LIBRARIES

Bendix Field Engineering Library

Colorado State University Library

Denver Public Library

Learning Resource Center

Library, Chicago Office, DOE

Library, Grand Junction Area Office, DOE

Library, Idaho Office, DOE

Library, National Atomic Museum, DOE

Mesa County Library

MEMBERS OF THE GENERAL PUBLIC

Roy Anderson

Richard Arnold

W.D. Bradbury

Mr. and Mrs. Sterling Bradham

Doris Butler

Dr. J.E. Burkett

Jerry Castle

Mike Condit

Barbara Doe

Dave Emilia

Prof. H. Paul Friesema

Martin Garber

Mark Gibson

Laura Gonsalves

Frances M. Green

Eugene Grutt, Jr.

Ruth Hutchins

Elton and Rosina Johnson

Chris Jouflas

John Kenney

Paul Klite

Erv Krueger

Dottie Martin

Toby McLeod

Rusty Muller

Ted Nation

Bill Nelson

Virginia Nelson

Frank Nemanich

R. Paul Oliver

John F. Peeso

Joe Pierce

Cindy Richardson

Mr. and Mrs. Barney Roberts

Mr. and Mrs. Bill Roberts

William Robinson

J. Sanchez

Alan Schwartz

Mr. and Mrs. R. F. Stewart

Glenn A. Stout

Willis Strong

A. C. Thomas

John Thomas

Vic Thompson

Tim and Pat Tomlinson

Al Tschaeche

David Tunderman

Walter Vanderpool

Ken Weaver

Gilbert Wenger

John Whiting

Mr. and Mrs. Frank Wilhite

R. Young

INDEX
(listed by section number)